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WHY A PRODUCTION DEPARTMENT?

Many a production department is an example of a function that survives because its activities have been made to appear so complex that management cannot make up its mind what would happen if it were done away with

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MANUFACTURING is the product of two simple operations: getting material into the plant, and getting it out again. The first operation calls for purchasing, inspecting, and storing material in its raw state. The second requires planning, dispatching, and fabricating. Each is a combination of simple sequential functions if left exclusively to the department that is directly responsible.

In view of the clarity of the law of responsibility and authority, it is difficult for the average shopman to see why management should insist upon changing a simple operation into a complicated process. Mere mass does not add complication; instead, it simplifies. The law referred to reads, "Responsibility for the execution of the work must be accompanied by the authority to control and direct the means for doing the work."

If this law means anything it means that one department shall have the responsibility of getting material into the shop, and that another shall have the authority to get it out. It does not mean that one department shall purchase the material, another one order it, still another receive and check it, another inspect, another test, and a final one store it. The law of material control means: "providing the required quantity of product, of the required quality and condition, at the required time and place." The purchasing department has not provided material until that material has been received, has met both shop and engineering specifications, and is in rough stores. This can be accomplished as a single operation regardless of how many individuals are concerned, but when it passes to a second department, the responsibility of the first one ceases. It should not be necessary to argue the efficiency of having one department responsible instead of having six making out reports, each waiting for the other to act. It is a commentary on management that it spends large sums to save time and then wastes that time in inter-departmental delays.

Manufacturing is equally simple: Getting out material means processing it and placing it in finished stores. Assembly is incidental because it is a constant. The law of production control that applies to getting out material, differs very little from the law of material control that applies to getting it in. The only difference is that the one "provides . . . . at the proper time and place," and the other "produces . . . . by the best and cheapest method." "Method," it will be noted, is singular.

The controlling factor of repetitive manufacture is time, and when material is in rough stores at the scheduled time material control has been effected. Material control is 90 per cent of production control, and with sufficient material and efficient planning, 75 per cent of items will progress in orderly procedure with the plan. There is no need of more than one department to get material out.

From the shopman's point of view the chief concern of a non-productive department is to extend its functional jurisdiction, and its most important duty is to resist encroachment upon its prerogative. Some of these

departments become so proficient in this latter accomplishment that they can even detect an implied enroachment. Theoretically, the shop activities of non-productive departments are for the benefit of the shop. Management so intended them, but it forgot that "a good intention clothes itself with sudden power."

It is true that the shop needs help. But irritation is not help. It is true that a product needs inspection. But why assume that a man working for a chief inspector would be conscientious while the same man, doing the same work for the superintendent, would not?

The shop needs costs and estimates as a basis of comparison, but why should the figures compiled by a clerk in the office from the shop's records be more accurate than costs filed by a clerk in the shop itself? It also needs a check on its planning and its promises, but why fool ourselves that a promise made by a production man to his chief will be kept any better than one made by a foreman to his superintendent?

"Responsibility for the execution of work must be accompanied by the authority to control and direct the means for doing the work"

The shop needs help but not dictation. It needs support, but not a guardianship. It needs help when and as asked for, not help forced upon it in order to increase the size or perpetuate the existence of some other department.

Visualize to yourself an efficiently managed factory, with one department responsible for incoming material, another for outgoing material, and ask yourself what duties a production department should perform, or where it fits into the shop management. Make a sequential organization chart, and find a place for it. The production department has been the "handy man" of management, but like the shop handy man, its usefulness has been ended by better shop methods and management.

The various functions of shop management are interdependent parts of a complete process. When the authority for different functions is placed in different places, it makes a break in sequence and continuity, at which manufacturing must come to a full stop.

The production department had its beginning in a liaison man between the office and the shop. The early shop executive was wholly mechanical in his training and inclination. He was more interested in the methods of production than in the cost or time of production. In many shops he was the only engineer. In others he worked out the ideas of the owner or the single engineer employed. He was supreme in the shop; he tolerated no dictation and accepted but little advice. His education was limited, but his ingenuity was not. He anticipated our present mass and interchangeable manufacturing methods by almost 100 years. He was responsible for our automatic machinery. True, he sometimes bankrupted the firm that had to bear the expense, but he justified his mechanical ability.

The original shop owners had no trouble getting along with their superintendents, because the two had mutual respect and were usually social friends. When sons, or collateral heirs, took charge it was a different story. There was no sympathy and little understanding between shop and office. The superintendent usually thought that the office was ignorant not only of shop methods, but of business methods also. The shop was even more of a mystery to the office, and while the manager knew that the superintendent was ignorant of business methods, he thought mechanics were born, not made, and he feared to let him go lest he be unable to replace him.

There is no advantage in being an owner or manager if one must fight continually with his shop superintendent. Being ignorant of shop methods this manager was at a disadvantage in any argument, and the obvious recourse was to hire a man with some knowledge of both business and shop methods and let him do the fighting or coaxing.

Authority is taken, not given, and the production man from time to time assumed responsibilities and took unto himself functions that unduly magnified his importance. In time he made himself the head of a department. He had the ear of management and, furthermore, he was always right, because neither he nor the shop had any method of visualizing plans or the execution of those plans. In thirty years of shop experience, both as victim and superior of production departments, I have never known an instance where they were at fault, particularly when I occupied the lower position. They were all good fellows and honest; it was merely a case of the blind attempting to lead the blind—and one had the ear of management.

On the other hand, with shop conditions as bad as they were, and management as weak as it was, America would possibly never have arrived at its present manufacturing pre-eminence had it not been for the production man. Management introduced simultaneously interchangeable manufacture, mass production, inspection, wage incentive, and cost accounting.

The new order of things required a complete reorganization of ideas as well as of methods, and necessitated new tools and fixtures which the shop executive had to design. It meant new men whom the foremen had to train. In addition, the shop had to wet-nurse the various clerical departments that were evolved during the reorganization. As might be expected, confusion resulted and the aid of another nurse was invaluable.

Handy-Man to Efficiency Expert

The production department was admirably adapted to act as handy-man for the many ideas of the pseudo-efficiency expert. It adopted his methods and became even more autocratic in its functioning.

As a result of the dissatisfaction this caused, management decreed that the production department was merely a co-ordinating agency. In the shop lexicon, co-ordination means service. In the production version it means the assumption of any necessary authority, whenever and wherever necessary in order to get results. Where it did not coax, the production department used the driving methods that the old-time foreman is supposed to have used. A little more subtle, perhaps, but none the less irritating. Having no definite authority, no definite functions or technique, it could only drive, bluff, and coax to get the results it considered necessary.

As a result of this practice, management learned that production could not be stimulated by pushing the individual worker. Possibly it read this in the advertisement of a popular brand of evaporated milk. Driving was wrong not because it was an injustice, but because it was

an irritation that was resented, and consequently had an effect opposite to that desired.

Management apparently did not learn that the practice was just as disastrous when applied to foremen, because the man could complain, while the foreman could not. He was either actually or theoretically wrong at all times. That this is no longer so, lies principally in the fact that the reasons for both the driving methods and the department itself have disappeared.

Management is learning that it is cheaper to head a shop organization with a man who is both a mechanic and an executive, and give him the necessary staff to assist him, than it is to have separate departments to embarrass him.

To clarify my contention and eliminate the personal equation, let me add that, in many cases I know of, the production head is more fitted to "control and direct" than is the shop head. This does not weaken my contention, because such a man at the head would no longer be a production man, but a shop executive. It is essential that a production-type man be head of the shop operations. He must have a knowledge of all the functions that concern production. If he has a mechanical education so much the better. If he is not a mechanic he must have a good mechanic under him. In either case, the production department, as such, is unnecessary.

Something Wrong with Management

It is admitted that a production department is necessary in many plants, but where this is true there is something wrong with the shop management. If the production man is the more able, put him in charge of the shop and eliminate the production department. If the shop man is more able, do the same thing. There is neither ethics nor economy in placing a clerical man with a half dozen men under him on the same or higher plane of pay and authority than a superintendent who has to hire, train, and retain a thousand men.

The proof of a pudding lies in how it agrees with the internal organization. The same is true of any system, and it is natural to ask how such an arrangement would work out.

One efficient plant employing over a thousand men holds the purchasing department responsible for material until it is delivered to the manufacturing department. It is responsible for inspection, for tests, and for rough stores. Material is not "in" until it has fully met engineering specifications and has been placed in the storeroom.

Any engineering department that desires to check up on its material has an undoubted right to do so, but it has no right to interfere until that material is accepted or rejected by the purchasing department, nor has it right or title to even suspect that the purchasing department will order or accept material that is not in accord with the specifications.

"The highest efficiency in the utilization of materials is obtained by providing the required quantity, of the required quality and condition, at the required time and place"

The shop mentioned has no conflicts of jurisdiction or authority because it understands thoroughly the principle of physical and technical control. The idea that "no man can serve two masters" does not apply when the man is serving each master at an entirely separate time, or is lent by one master to another. The inspector who inspects incoming material is under the physical control of the inspection department. But his reports all go to the purchasing department. The efficiency of this arrangement is startlingly obvious. The testing laboratories must be manned by chemists and engineers chosen by those capable of judging of their capabilities, and managed by someone who can lay out test specifications and see that they are followed. The engineering department is the only one that can do this, yet the reports on incoming material at this plant are no concern of the engineering department unless they are submitted to it by the purchasing department.

"The highest efficiency in production is obtained by producing the required quantity of product, of the required quality, at the required time, by the best and cheapest method"

The purchasing department is wholly and actively responsible. It cannot fall back upon the excuse that the test results were held up by the engineering department. Neither can it plead that the tests required too long a time.

Where all, or a considerable part, of material must pass physical or chemical tests within narrow limits, it is conceivable that rejected or doubtful material might move slowly. Ordinarily it does. But where the purchasing department must have the material in stores at the scheduled time, and not merely in the factory, the technique of receiving and returning material is entirely different from that ordinarily employed.

The plan works so well and the logic of the arrangement is so apparent that the method is not thought to be radical, nor is it. It simply means that the manager thinks in terms of plant efficiency instead of jurisdictional prerogatives, believes the head of each department to be industrially honorable in his relations with any other department and accountable for results of those relations.

Where responsibility is logically placed, there are no evasions and few mistakes. The usual trouble is that the term responsibility is accepted as authority, instead of accountability. The two are not synonyms.

What corresponds to the production department in this plant is called the "Planning and Production Department." The actual planning is done in conference by the heads of shop departments headed by the factory manager. Representatives of the engineering and purchasing departments are present. This conference is a weekly affair held after working hours so that there will be no interruption. The planning and production department records the planning, shows the results of the previous planning, and reports on present and future needs. In other words, it is really a co-ordinating and visualizing department. It reminds foremen of their

promises but does not coerce them. They alone are accountable.

The original idea of a production department was that it should be such a planning and co-ordinating department, but in the beginning it did not know how to plan, and if it had known, the shop organization would not have been capable of carrying out the plan.

I have in mind still another plant where the material requirements were planned and then visualized without any thought of the effect upon the production department. It soon became apparent that the material department was the logical one to be responsible for both rough and finished stores and to indicate to the production the items of finished material wanted.

"The highest managerial efficiency is obtained by functionalizing the duties of the executives"

As the scheduling was in terms of time instead of quantity, and the dispatching, therefore, was automatic, the only work left for the production department was to follow up the few exceptions visualized by the material department chart.

At the time, to dispense entirely with a production department seemed too radical a step, so the manager compromised by making it responsible for tools, a much more logical field, when one stops to think about it. The production department indicated to the shop when both tools and material were available, and dispatched or scheduled an exception, after it was in the shop department.

This would appear to be, and is, an entirely different arrangement than the one I just held up as a model. There are two reasons for the difference. First, it was a branch plant, and the purchasing agent made only local purchases and transmitted invoices. The material department, consequently, was the logical one to hold entirely responsible for incoming material and rough stores.

It was not the logical one to hold responsible for finished stores. But inasmuch as visualization is of little use unless shown on the mathematical principle of "from two known factors, the third, or unknown, factor may be found," the finished stores indication was forced upon them as it were. The two factors of material control are rough, and finished. From them the third factor, condition, may be found.

In both the plants referred to the same thing was apparent: that the production department, as a coercing medium, was not necessary when planning took its place. Second, it showed that tools are the neglected item, and the only one that could not be visualized in terms of two factors. In the first-mentioned plant, which is of the contract type where everything is made on order and each order requires a new plan, the production head has changed over to a planning head, which is equally important and more consistent. In the second plant where the work was repetitive, there was no place for the production head, because the planning was permanent like a railroad time table; the dispatching was automatic like the trains shown in the time table, and the exception was visualized.

Having had unusual opportunities for studying production from every angle, as well as thirty years' experience as an executive, I am firmly convinced that there is no need in industry for a production department as an entity. I am also convinced that it is unjust to an efficient superintendent or factory manager, with, sometimes, several thousand men of many trades under his jurisdiction, to be outranked by a production manager with possibly a dozen men reporting to him.

It is also an economic waste because, in the very nature of things, having no definite duties or authority, a production man cannot possibly perform any functions that a foreman cannot perform. "Getting out" material involves planning, plus checking the execution of the plan, which is follow up, and manufacturing, plus checking, which is inspection. Both of these auxiliary functions are incidental to getting material out, and at the most require no higher authority than a foreman to head them up. The production head cannot manufacture and can only record the plans of others, while the manufacturing head can both plan and carry out the plan. There is room for only one, and is it not obvious which one that should be?

A law is something that happens in a majority of cases. There are two exceptions to the above; one occurs when a division of responsibility is necessary because of the size of the company, or the nature of the product. Even in such cases, the production department is usually a general planning department, though it may be called production. The other exception obtains where the factory head is not an executive, and where, because of special mechanical knowledge or length of service, it is not policy to replace him. There is no exception to the rule that an executive must head the factory, a mechanical executive if possible, a technical one if necessary.

Where, then, should a production department, if any, fit in? What should be the rank of its members? The answer would be easy. We classify and pay our foremen in proportion to the knowledge necessary in the conduct of their respective departments. We add to this basic rate according to the size or importance of their departments.

Taking the basic item, how much special skill or knowledge is necessary in a production department? Is it as much as is necessary in a pattern shop? A tool room? A forge shop? Are the production duties constructive, clerical, or merely police duties?

Preparing Metals for Machining —*Discussion*

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WHILE agreeing in a measure with the article by Charles F. Henry on page 616, Vol. 73, I take issue with this statement, "One way to attack this problem is to use some of the superhard tools that will cut through the scale." As a shop superintendent I contend that castings and forgings should not be accepted with abnormal scale or if not of good machinable quality. A superintendent should not accept material which adds to the machining cost. No one knows better than the machine shop foreman the extent to which work is delayed when hard castings come into the shop, particularly if they require milling. Milling is a very economical operation, but it must be served with well selected material.

Seven prominent builders use various methods to obtain the required

FITS AND TOLERANCES IN AUTOMOTIVE ENGINE BEARINGS

SATISFACTION in automobile engines depends largely upon the way in which the various bearings fit after assembly. The degree of quietness in operation, the life of the engine, and the builder's reputation are all affected by poor fits. The practice of different automobile builders varies rather widely in this respect, perhaps more widely than the performance of their engines in use might indicate. It is evident, however, that all the leading builders have given the problem of bearing fits careful consideration and are earnestly trying to build engines that will be satisfactory in service.

A study of the methods used by well known engine makers is not only of interest, but may also be suggestive of modifications that will benefit all concerned. With this in mind, the recent practice of five builders of engines for automobiles, either in their own cars or in cars of other makes, is given here in outline without naming any of the makers.

Case A

The crankshaft bearing caps are bolted down tightly in the crankcase with three shims, each 0.0015 in. thick, under each side. The bearings are then bored in a special machine with a fly-tool boring bar to a total tolerance of 0.001 in., or from 2.500 to 2.501. The crankcases are then inspected and sorted into five sizes, the first four vary by 0.0003 in. This gives bores of 2.500, 2.5003, 2.5006, 2.5009 and 2.501 in. The cases are marked with paint, each size having its particular color. Crankshafts are, of course, sorted in the same way and parts with corresponding colors are assembled into the same engine.

The minimum fit or oil film clearance desired between shaft and bearing is 0.001, with 0.002 in. as a maximum. To secure the desired fit, crankshafts are ground and lapped to 2.498-2.499 in. and are selected by color to give the desired clearance. This method of selection makes it possible to secure the proper fit without, in most cases, disturbing the shims. If, however, one of the shaft journals should be, for example, 2.4986 and the corresponding bearing be 2.5009 in. there would be a clearance of 0.0023 in. Under this condition one shim would be removed, reducing the bearing diameter by one-half the shim thickness, 0.0015 in., or 0.00075 in. This would make the bearing 2.50015 in., or a clearance of 0.00155 in., well within the desired limits. This company finds that it is necessary to remove a shim to secure the proper fit in only about one per cent of the engines assembled. These results indicate very clearly that, although this engine builder uses shims in the various bearings, the shims are for aiding the user or service man in securing proper fits after the bearings have worn. In fact, it is expected that the three shims will allow ample adjustments during the life of the engine.

Case B

This company builds a small engine and uses shims both in main bearings and in connecting rods to secure a proper fit by selection. The shims are all 0.0025 in. thick, giving an adjustment of 0.00125 when one shim is added or removed from one side of the bearing. Main bearings are line-reamed to 0.001-in. tolerance. Connecting roads are broached to 0.0005-in. and crankshaft journals ground to 0.001-in. tolerance.

Case C

This maker builds cars of medium size. The crankcase is bored to receive bearings consisting of babbitt-lined shells. After rough and finish boring, the bearing seats are line-reamed to a tolerance of 0.00025 in. plus or minus, or a total of 0.0005 in. The reamed holes are tested with an aligning bar and held to 0.001 in. The shells are checked for outside diameter, wall thickness, and the height of the split from the top of the bearings—the tolerance being 0.00025 inches.

Main crankshaft bearings are ground and lapped to a plus or minus tolerance of 0.0005 in., or a total of 0.001 in. No shims are used. Crankshafts are not selected, the tolerances named keeping the oil film clearances within limits that are considered satisfactory.

Case D

The use of shims depends upon the type of engine. For motor vehicle engines, this company uses shims in the connecting rod bearing only. In industrial engines, shims are used in both connecting rods and main bearings. The shims are not to control clearance but to aid in securing the desired fit when the engine is overhauled.

Crankcases are line-reamed to receive bronze-backed interchangeable bearings, but the bearings themselves are not reamed, broached, or otherwise machined after being put into place.

Tolerances on main and connecting rod bearings are

0.001 in. On the crankshaft itself, the main journals are held to within 0.0005 in. while the crankpins have a 0.001-in. tolerance. Oil film clearance on the main bearings is 0.002 to 0.003 in. On the connecting rod bearings, the clearance is from 0.0005 to 0.0025 in.

No form of selective assembly is used, maximum and minimum tolerance giving the clearances stated.

Case E

This company uses no shims in any bearings. Main bearing seats in the crankcase are line-bored with a single point tool, and are then finished with inserted-blade reamers to a tolerance of 0.0005 in. Interchangeable bearing shells are used and are not machined after assembly, giving an oil film of 0.00125 to 0.00275 inch.

Tolerance allowed on main crankshaft journals is 0.0005 in. On crankpin journals, 0.001-in., and on the piston pin bearing, 0.0003-in. tolerances are allowed.

Case F

Another case which affects bearings but has nothing to do with shims, may also be of interest. An engine builder who used Duralumin connecting rods made a series of tests on the effect of expansion and contraction on the large end of the rod. He made up eight rods with Duralumin caps, giving a different clearance in each rod. These clearances varied by 0.00025 in. from 0.0012 to 0.00315 in. These rods were subjected to a 40-deg. temperature drop and all turned freely of their own weight on mandrels giving the clearance noted.

In the next test the rods were put in an ice box and brought down to 8 deg. below zero, F., a drop of 76 deg. All rods turned of their own weight except the one with only 0.0012-in. clearance. This was readily broken loose and then turned easily on its mandrel.

Tests were made of the same kind of rods fitted with steel caps. Here the clearances were reduced so that the minimum was 0.0006 in. and the maximum 0.0023 in. Subjected to the same tests these rods behaved much as the first set, but the rod with the minimum clearance required less effort to break loose than those on which the Duralumin cap was used. In no case was the effort required more than that exerted by a good starter. The difference can, of course, be ascribed to the lower expansion and contraction ratio of steel.

Case G

This builder uses no shims. After rough and finish boring a line reamer removes a few thousandths from the crankcase, the reamer being guided in two bearings. This operation is held within 0.0005 in.

Bearing caps are then removed and babbitt-lined steel shells are put in place with 0.005 to 0.006 in. draw to force the shells firmly in place.

Crankshafts are ground to 0.001-in. tolerance on main journals and 0.002-in. on pins. Each bearing is measured as the crankshaft comes to the assembly line and each bearing is Martell reamed to give the desired 0.0015-in. clearance for oil film. This method maintains the desired clearance without requiring great accuracy in grinding the pins and main bearings. For taking up the bearings after wear, the service man removes a few thousandths by burnishing the caps on abrasive cloth or on a lapping plate.

$20,000 a Year from Waste Heat in the Forge Shop

IN THE average forge shop, heat is a commodity found in such abundance that it is surprising that little attention has ever been paid to conserving at least a part of it. A notable exception is found at the Kropp Forge Company in Chicago where utilization of only a portion of the waste heat available in the shop has resulted in large savings in fuel and power costs, according to an article in *Power*. Beginning with the use of waste gases from the stock heating furnaces for generating steam for the hammers, the company eventually decided to install mixed-pressure turbines to recover from the exhaust of the hammers the remaining heat available in the form of electrical energy. With plenty of steam-operated hammers, a continuous supply of exhaust steam is available to generate the entire electrical load and thus replace purchased service except for night lighting. When anticipated extensions to the forge shop, including electric furnaces for annealing the forgings, and the installation of another large crane, have been made, the savings in operating expense will amount to about $20,000 a year.

Each of the large hammers is provided with a service unit consisting of two oil-fired furnaces located one on either side of a 15,000-sq.ft. water-tube boiler that supplies steam to the hammer. Waste gases from the furnaces give up their heat to the boiler, which also has supplementary oil burners set in a Dutch oven in front.

Previously, eight of the hammers had been connected to a common exhaust main to supply heat for the building and for the boiler feed water. Recently, further economy was obtained by utilizing this exhaust steam to supply two mixed-pressure turbines of 500 and 300 kw. capacity. The exhaust steam from the hammers comes to the turbines at a pressure fluctuating between 3 lb. gage and 5 in. vacuum. At the lower limit the turbine is automatically changed over to operation on high pressure steam, which in ordinary service ranges from 80 to 120 lb. and is supplied direct from the waste-heat boilers previously mentioned. When the pressure in the exhaust main rises to atmospheric, low pressure operation is resumed. As the plant is practically automatic in operation, only starting and shutting down require attention.

As a result of using the waste heat of the gases and exhaust steam there is no fuel expense, and no additional labor is necessary, although the chief engineer gives the plant part of his time. The investment in equipment totaled $60,000, but as the only expense is the overhead charge on this investment it is estimated that with a 150 per cent increase in load from a proposed shop extension, the saving in the annual current bill will be $20,000. Calculating 12 per cent overhead charge on the $60,000 investment, or $7,200, the net saving or profit over the former operation would be $13,000 per year.

Welded Construction for Special Machines

WELDED JIGS are practically accepted as standard today. In the plant of the Kearney & Trecker Corporation, Milwaukee, welding has been adapted to the construction not only of jigs but also of special machines, often rather large. Three outstanding advantages have been found in the case of welded tools, namely: quality, possible completion in a relatively short length of time, and a reduction in manufacturing cost.

One of the first steps the company took in instituting welded construction was to instruct the draftsmen in the art of welded design by having these men follow the progress of the tools through the shop. From this experience they learned how to determine the thicknesses for walls, braces, and supports, and the proper welded joints to specify for given designs, as well as miscellaneous constructional features considered basic to the built-up method of construction.

Actual shop operations were based on the experience gained with the first new tools constructed. This procedure follows the usual practice: Layout, cut out the various members by acetylene torch, tack weld the units together, inspect for alignment and correctness, arc weld complete, anneal, sandblast, machine complete, and paint. It has been found advantageous to select welders who not only are familiar with welding, but who also have a general knowledge of tool construction.

Accompanying illustrations show what a neat and workmanlike appearance has been obtained by careful attention to the finishing of the tools and machines. Sandblasting accounts for this partly, as well as skill in depositing the weld metal, but the final effect is given by "filling" the metal after the first coat of paint, just as is done with castings. In the welded units this filling is particularly important at the fillets, and is followed by a rub-down with sandpaper before the finish coat is applied.

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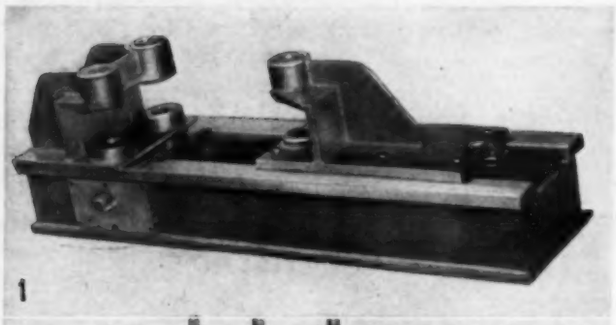
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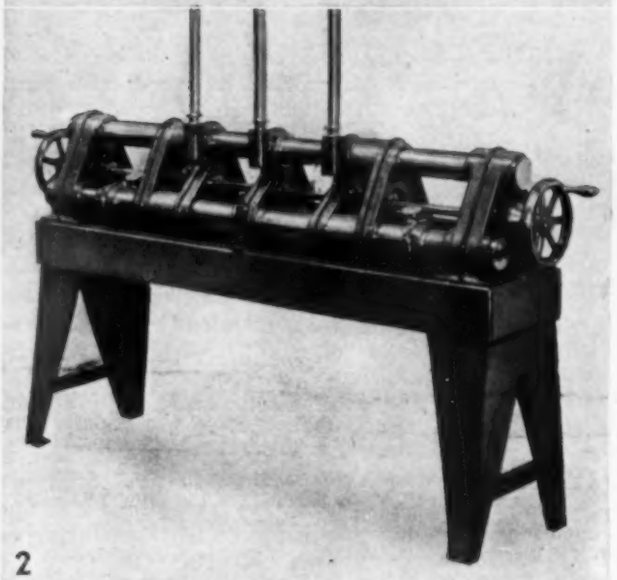
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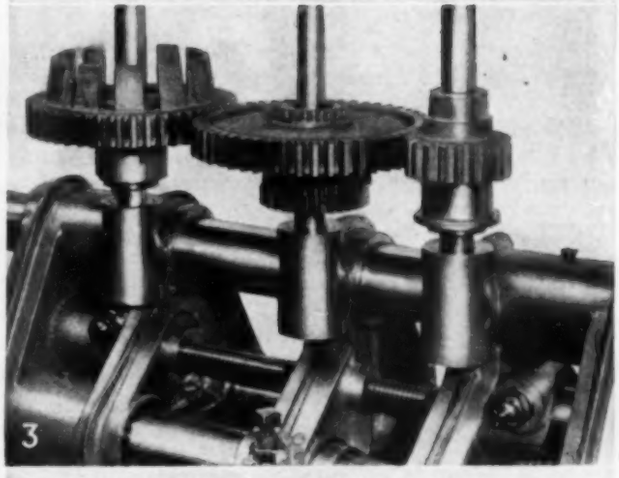
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[1] Welded construction is used entirely for this gear burnisher. [2] A special precision machine such as this gear-tester can be built with the desired accuracy and good appearance by means of welded shapes. [3] Close-up of the gear tester unit in use, showing how refinements of detail have been carried out, particularly in the finish of welded joints. [4] Standard pipe cut in half, with plates welded between, forms the body of this triple-spindle driving head

EXECUTIVE FORUM

Filling the Gaps

AN IDLE machine, or an idle department, is always a thorn in the side of a good production man. Edward Ellis, Works Manager of the Power Pump Company, instinctively avoided the quiet spots in his shop. But he didn't forget those silent zones, and his mind worked overtime on ideas to restore their old activity.

"It never set quite right with me," said Ellis to Victor Andrews, the Chief Accountant, "that we should continue to buy mechanical parts when we have excess shop capacity. Take valves for example. I've been doing some figuring, and I've estimated that we can make them for somewhat less than we pay for them outside."

"That's surprising," said Andrews. "We get valves at a pretty low price. I've always thought that it would be hard to touch the cost of a company specializing in them. Have you any figures with you?"

"Yes. Here they are," said Ellis pulling a slip of paper from his pocket. "I took the price of the last lot we bought and figured our shop costs against it."

"I won't quarrel with your time and material," said Andrews, "but the overhead is 'way low. You know our rate is nothing like that."

"I figured only the additional overhead that would be necessary to make the valves," said Ellis. "We have the floor space and some of the machines now. We're paying interest, taxes, and other fixed charges on this investment. All I've included is the service costs and carrying charges on the few extra machines we'll need. That's the only fair way to estimate the cost."

"It's poor accounting practice," said Andrews. "How would it look to have our valve cost almost half that of a similar part made in some other department—just because we started making the valves later. You're just fooling yourself when you base your costs on a premise like that."

"Not nearly as much as you accountants fool yourselves with your figures," said Ellis. "My plan may not be good accounting, but it's good common sense. When we start making valves, we'll hire more men, buy some new machines, and put waste space to use. This will promote prosperity and save us some money besides. Even figuring it your way and taking the full overhead on the valves, we'd reduce the burden on the other departments."

"You should know more about the manufacturing end than I," said Andrews, "but I know that starting a new process involves a lot of grief. You will not only need new machines but special tooling as well. You'll probably have considerable spoilage before you get going properly. When business picks up, you'll need that shop space and we'll start buying valves again. That means we'd have to depreciate all new equipment at a rapid rate. I believe in wise expenditures to promote business activity, but I don't see how you'll help matters by curtailing parts purchases."

"In times like these, each manufacturer has to look out for himself," said Ellis. "Here's a chance to keep our shop busy and our men employed. Why should we place business outside and pay someone else a profit when we need the work here? This isn't a philanthropic organization."

"Simply because it's a sounder policy than to resort to temporary expedients to stimulate production," said Andrews. "By distorting cost figures you may be able to show an advantage by making parts here. But conditions now are unusual. I doubt that you'd be ahead of the game in the long run. Larger concerns than this are buying more and more of their standard parts. They find that it pays."

■

What Do You Think About This Problem?

When part of the shop is idle, production men look critically at purchased mechanical parts. They question at once the advisability of buying anything that can be made in their own plants. It appears that if the outside price can be met in labor, material, and even a small portion of the overhead, the shop will be better off. Is this reasoning logical, or is it better to continue outside purchases? Are temporary departures from standard accounting practice warranted to meet unusual conditions?

. . . Discussion

of Executive Problems

■

Misguided Loyalty?

Loyalty to the firm consists of using one's knowledge, training, initiative, and resourcefulness to further the firm's interests through the medium of one's particular work conducted in a spirit of kindly cooperation. Through observation and study, one should prepare to step into the breach and swing a job of greater responsibility when the need arises.

In this program, betrayal to the management of the personal confidences of one's associates and immediate superior plays no part. Such betrayal is reprehensible; it savors too strongly of espionage. The executive who invites such betrayal, even under the guise of business expediency, would himself be reluctant to impart confidential information to the betrayer.

—John A. Lawson,
The Heald Machine Company.

The Fewer the Higher

Does the question of the price to be charged for repair parts have to be settled by the cost department? We have been told for the past twenty years that manufacturing is the rendering of a service; that the material thing made is a sort of by-product.

The question is not, what will it cost to make a new part in the shop of the manufacturer, who apparently has the patterns, tools, and jigs to make a new one at the least possible expense, but what will it cost the owner of the planer to replace the part in his own shop or in some local jobbing shop where the facilities are far poorer. —E. H. Fish.

On With the New?

By all means promote the tool room boss. Tell him what you expect of him and send him around to a few factories to observe their methods. Induce him to read suitable magazines on management. With a little guidance, he will more than make good, saving his firm many times the cost of a new man.

I have observed, time and again, that a tremendous amount of money is spent educating new men, including sending them around to different factories, yet most executives wouldn't think of doing the same thing for men available in the organization. It is my conviction that, if half the money were spent on educating home talent in the weak features, better and quicker results would be obtained. —J. C. P. Bode.

On With the New?

Promotion from the ranks is a policy, good in theory, but not so good in practice, because the men most insistent are more interested in the promotion than in making themselves ready for it. There is no question but that, of two thoroughly qualified men, one in the shop, and one outside, the inside man should be promoted.

The upsets caused by introducing men from the outside are exaggerated. There is sure to be a certain amount of bad feeling at first, but if both the organization and the new man are working for the company interests, in four to six months this feeling is forgotten and everything is running smoothly again.

On the other hand, it should be borne in mind that a great many men—square pegs in round holes—may be just passably good at their job under some one else's supervision, but when suddenly entrusted with full responsibility for certain functions, broaden out amazingly and develop into first-class executives, releasing forces in themselves of which their employers were totally unaware. —W. A. Walter, *Purchasing Agent. Pneumatic Scale Company, Ltd.*

Dole or Control?

The skill and attention that has been applied to bring machinery and methods of production to their present high standard, has not been used to control the results of increased output per individual. If the efficiency of the machine increases and hours of labor are not reduced, a small number of workers will supply the world's requirements, while the remainder are on the dole.

Without control, the machine has not brought great benefit to the operator, who as a result of price cutting, finds himself still working a 48-hour week for what is called a living wage. This theory indicates that the profits of faster production should be divided between employer, worker, and customer. Hours of labor should be adjusted to employ the maximum number of men.

—P. W. Nielsen, *Cheshire, England.*

Nobody seems to know all the factors that cause unemployment; consequently a remedy cannot be found. One of the causes is speculation. The Federal Reserve system's attempt to stop speculation in Wall Street by closing down on credit was thought to be a step in the right direction. But this made things worse, at least temporarily. Perhaps the tremendous regulating power invested in that bank and exercised in this way will work out satisfactorily in the long run. Extended credit in bad times must of course stimulate business. Making money more expensive when business is good will tend to prevent speculation.

Another cause for unemployment is buying on instalment plans. If one buys goods today that he really cannot afford to buy until a year from now, he invests buying power that he really should reserve for another year. To take care of this advanced business industry expands and becomes too big. This must result in losses and unemployment.

If big business combined for the purpose of eliminating all wastes instead of dictating prices, conditions would improve. The re-equipment question should be taken up at slack periods. International business should be favored.

Everybody who has a vote and pays taxes has a right

to expect that the state will do something for him if he is in distress. Dull seasons are the times for the state to order equipment, and start jobs to relieve unemployment. Every worker, who has no capital, should in good times save some money in case he gets out of a job.

—A. E. FRISTEDT, *Bolinder Works, Stockholm, Sweden.*

Anticipation Without Realization

To discontinue a bonus or privilege of any kind, without previous notice or warning, will always cause dissatisfaction in the minds of the disappointed, as the average recipient generally has his bonus spent before it is due. The case for the bonus system should rest on the basis of results, and be entirely an incentive to increased production. To pay a fixed sum each year, robs the bonus scheme of its main idea—incentive. Each foreman should be given a certain percentage of the profits, over a fixed sum. He thus automatically becomes a partner in the concern and is vitally interested in the maintenance of a high level of productive efficiency.

A long service bonus, on the other hand, is generally instituted only by long established concerns, and in many cases the employees associations pay a portion of the gratuity. Any bonus scheme should undergo considerable scrutiny before being put into effect, as unwise commitments in this direction often are productive of disloyalty instead of loyalty.

—ROBERT S. ALEXANDER, *Universal Winding Company.*

At first I was tempted to say that the men were not presumptuous in regarding the payments as due them. But when we consider that the men "feel that a statement of the change in policy should have been made if the payments were to be discontinued," we must conclude that the two years of corporate management had caused the foremen to notice that changes were taking place. Without doubt, each foreman had a notion in the back of his head that the ten year bonus and other paternalistic relics which the old man had initiated were being discontinued by the corporate management.

Bonuses when paid for dividends earned through individual or specific group efforts, are a businesslike part of good industrial management. Length-of-service bonuses, with no proof of added earnings for the company, are uneconomic and undesirable. By far the majority of employees give better returns when pay checks mean "paid in full" each pay day. The only system of deferred wages of interest to the worthwhile man, is the increased pay checks he will receive when he has earned promotion.

—E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan Company.*

Speculating in Personnel

The business depression, through which we are now passing, has caused idleness to thousands of skilled and unskilled workers. Many a plant has been obliged to cut its force to a bare skeleton of what it was a year ago. Since the overhead goes on regardless of whether the plant is operating at full blast or not, it is up to the management to exercise rare judgment in deciding just what men are to be carried on the payroll during the slack period. Naturally a manager does not want to part with valuable men, who in all probability cannot easily be replaced, but the financial strain of paying out salaries week after week can be carried so far that the company may pass out of existence.

The only logical thing to do is to cut the force down to the very minimum in order that the organization be enabled to weather the storm. When business comes back to normal, it will cost money to break in new men, but this is all part of the penalty that all industries must pay.

Business depressions seem to come every few years, and until we understand more about the causes, very little can be done beyond trimming sails to suit the weather. Happily depressions seem to become steadily less vigorous, and human endeavor may finally eliminate them entirely.

—CHARLES A. PETERSON, *Master Mechanic, Cold Spring Granite Company.*

Home Work

The executive who makes a regular practice of doing his work at home may have a false sense of loyalty to his job. Other causes for home work are lack of concentration in the office, reluctance to delegate work to others, and the intoxication of the job itself. A machine is built for a single purpose; the human mind has many functions. Hold the mind to a single idea and it becomes a machine. Variety is necessary for mental hygiene. Just as we rest certain muscles while exercising others so we exercise different brain cells by directing our thoughts in different channels.

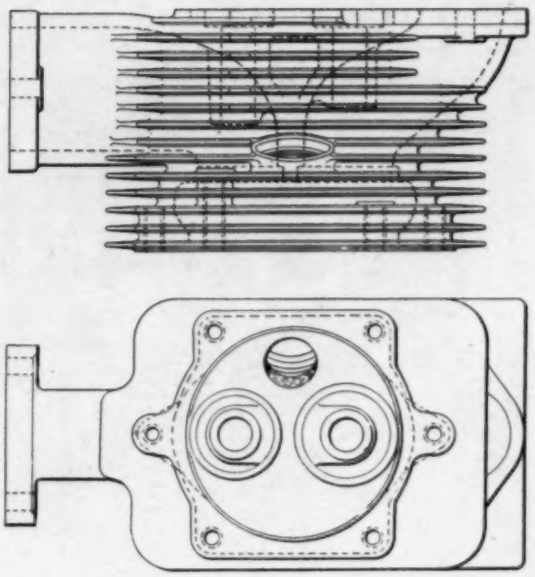
Aside from the gain from mental rest, diversified interests outside of business hours may contribute directly to the regular work. The remedy for home work may be to correct office conditions to allow for better concentration, or to choose an assistant capable of assuming some of the duties.

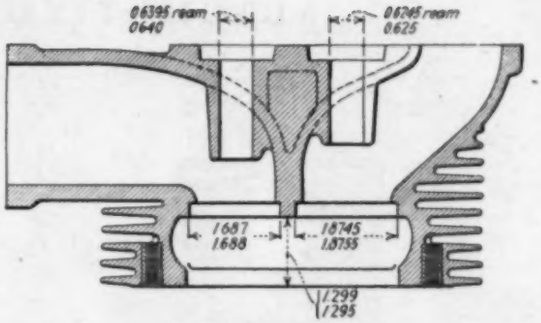
—HARRISON G. BROWN, *Supervisor of Standards, Crompton & Knowles Loom Works.*

With some executives, homework has become a habit and in many cases a very good one, if not carried to excess. It is difficult to concentrate on complicated problems in an office where interruptions are frequent; home work accounts directly or indirectly for many a promotion of a less able man over a more gifted one, and provides possibly the best alibi a man ever had for staying away from social functions. Homework is a means for the less brilliant to make up for his deficiency, while his more talented colleagues usually chuck the works the moment the whistle blows and forget all about shop until the next morning. By doing homework, a man shows an interest in his company outside working hours, which of course in the last analysis is interest in himself. If in doubt that homework in general is done by the type of executive mentioned, just take a good look at any large organization and note the curious fact that the men with the keenest and quickest minds are rarely found at the top but rather some persistent fellows with the patience of Job and the perseverance of a bulldog.

Executives are seldom master minds and they know it, but they are almost without exception men of sound judgment who have sacrificed much of their spare time and foregone many personal pleasures in order to meet the demands of their positions.

—DAVID GRIDLEY.





Franklin cylinder head, showing shape of the combustion chamber, which is machined all over. Aluminum-bronze valve seats are shrunk in place

O. R. MILLER
Production Manager,
H. H. Franklin Manufacturing Company

MACHINING ALUMINUM HEADS

for Air-Cooled Engines

The second of three articles dealing with various phases of Franklin engine production

CYLINDER heads used in the Franklin air-cooled engine are cast in permanent molds from an aluminum alloy and have horizontal ribs arranged parallel to the air flow across the engine. In top view the cylinder head is approximately rectangular, measuring about five inches parallel to the crankshaft of the engine and eight inches transversely. There is a flanged neck forming the exhaust port on one side. Vertical studs are employed to clamp the cylinder head to the cylinder barrel flange, and to hold the cast-iron valve rocker supporting plate to the top of the cylinder head. The valve rocker casting is secured at three points to the cylinder head, resting against bushings or shoulders surrounding the studs.

It was found that an irregular casting, such as that of the cylinder head, could be initially located most conveniently by machining the front and rear edges of the horizontal fins. In consequence, the first operation consists in grinding these two faces by feeding the head between two wheels on a Besley duplex grinder while the work is held in a clamping fixture. This operation is performed at the rate of 100 pieces per hour.

Top and bottom faces of the head are next milled flat on a duplex Ingersoll drum-type milling machine having a six-station drum. Castings clamped in the recesses of this drum rest against the previously ground edges of the fins. This machine has four cutters, a rough and finish cutter at each side of the work, and mills 75 pieces an hour.

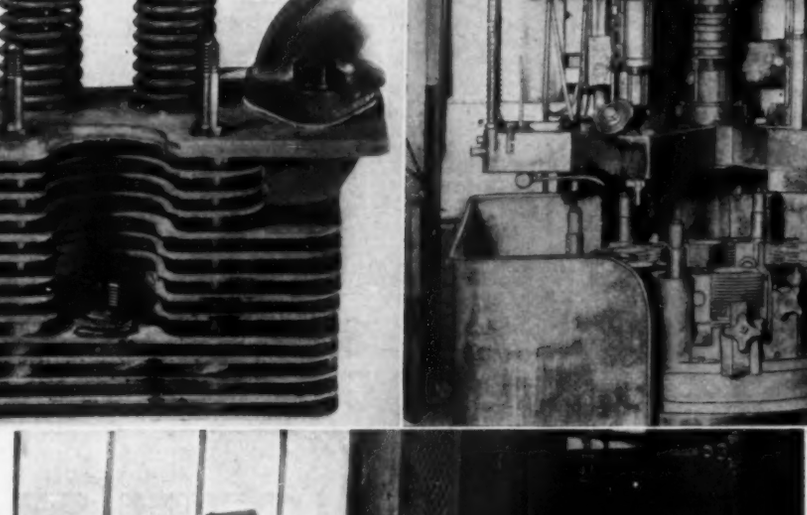
Five separate operations are performed in the third set-up on the rotating bed of a Natco multiple-spindle drill. The dial fixture employed has six stations and clamps the heads in an inverted position. After loading at the first station the work is indexed successively under each of five cutters which: (1) center the head; (2) rough the contour; (3) finish the contour; (4) finish a counterbore, and (5) drill six holes for the studs previously referred to. Three of the tools employed in these operations are milling cutters formed to special shape to give the interior surfaces of the head the desired contour. In the fourth operation, however, a fly cutter having a diamond-lapped tungsten-carbide edge is employed.

This cutter removes about $\frac{1}{16}$ in. of metal and must produce a finished hole, holding the diameter within 0.002 in. of nominal size. Much trouble was encountered with high-speed steel tools formerly used for this operation, but the tungsten-carbide cutter has now been in continuous use for nine months and has not been removed from the machine. All tools used in this operation are piloted by bushings in a plate which is raised each time a new piece is inserted and the fixture indexed. The milling cutter shanks are provided with bronze wear-plates, and one of the formed cutters employed has a high-speed steel head to which a carbon steel shank is welded.

In succeeding operations several holes are drilled in the head and some of them are counterbored and spot faced. Standard machine tools are employed for these operations, each being provided, of course, with a fixture

Finished head as it appears when completed, and with some parts assembled to it

Most of the major operations in finishing the combustion chamber are performed on this Nateo multiple-spindle drill with six-station fixture



Aluminum-bronze valve seats are pressed into place, using the fixtures shown, after the heads have been heated in the electric furnace in the background

which holds the work in proper position. A milling operation is also performed on a two-spindle, vertical Sunstrand drill which sizes the exhaust port. A hole for the aluminum-bronze insert which carriers the spark plug is also drilled and tapped. Valve clearance holes are bored also on a two-spindle, rigid Sunstrand milling machine. In this operation two heads are loaded while the other two are being milled.

As on air-cooled aircraft engines having aluminum heads, Franklin valves are seated against aluminum-bronze bushings which are shrunk in place. The counterboring operations required for these inserts are performed on two standard drill presses.

Prior to insertion of the valve seat, the heads are passed on a chain conveyor through an electric furnace in which they are heated to a temperature of 550 deg. F. Inserts, previously machined to size for pressing into the counterbores in the head, are placed over water-cooled mandrels having shoulders against which the inserts rest and so spaced as to fit into the valve openings. When the hot head issues from the furnace it is placed over these mandrels and is forced downward by a press which seats the inserts firmly in the counterbores provided. At the same time a stripper plate is pushed downward so that, when the press ram is released, the head is lifted up automatically by the stripper plate springs. The ram which forces the cylinder head down against the inserts is operated by a rack and pinion with a lever having an automatic lock which holds the head in position until it has cooled and is ready to be released. The stripper plate then forces the head upward. One man operating two presses of this type alternately completes the operation on 60 cylinder heads per hour. The same operator who inserts the valve seats also screws into position an internally and externally threaded bushing, also of aluminum bronze, into which the spark plug is screwed.

Heads are next passed to a drill press in which a special tool is used to spin over the edge of the aluminum around the valve inserts, the outer edge of which is

slightly chamfered. This locks the insert into position and eliminates sharp edges which are not desirable in a combustion chamber.

Following operations, performed on drill presses, include the chamfering of the inner edge of the spark plug insert hole and the retapping of the threaded hole through this insert. Holes into which the bronze valve guide bushings are afterward inserted are then reamed to size and other holes are reamed and spot faced. The valve guide bushings then are pressed into place two at a time. Both valve seat bores then are reamed while the reamers are centered in the hole through the valve guide bushings.

Valve seats next are machined in the valve seat insert, using a 30 deg. cutter centered on the holes through the valve guide bushings, to insure perfect alignment. To avoid any possible eccentricity in this operation, the cylinder head, instead of being held or even allowed to rest against the flat surface of a bedplate, rests upon a ball held loosely in a piece of non-metallic material, thus permitting the head to float in reference to the supporting table, centering itself.

The final operations on the cylinder head consist in tapping stud holes previously drilled. The cylinder head then is ready for transfer to the assembly department where valves are inserted and the head is bolted to the cylinder block.

■

Press Guards, Good and Bad
Discussion

E. ANDREWS
Manchester, England

HAVING read with much interest a series of reports entitled "Guards for Metal Work Presses," recently prepared by the British Safety Sub-Committee on Industrial Hygiene, I thought that a few further notes on this important phase of industrial safety may be of interest to readers employed in power-press departments. I previously commented on this subject in Vol. 73, page 278 of *American Machinist*.

In a summary of the recommendations in the above mentioned reports, it is pointed out that considered as a whole, the problem of protecting workers operating presses has a twofold aspect: "In the first place, it cannot be denied that the care with which such machines are built insures a high degree of safety to the operator. Further, for the purpose of safety, it is desirable that the following steps should be taken, whatever the type of press in use, or the kind of work done: (*a*) Presses should be examined every day before work is begun; (*b*) all mechanism transmitting motive power, such as gearing, pulleys, belts, and flywheels, should be fenced; (*c*) it should be made compulsory to equip all presses with a device preventing untimely tripping or repeating."

Apart from these fundamental requirements, which affect the whole domain of safety, presses should be equipped with supplementary devices, some of which (such as the safety clutch to prevent repeating) are always essential for the safety of the workers. Others are necessary in a great number of cases. These are considerations that concern the prevention of such accidents as are not really due to the working of the machines. But the operator must be protected from the tools during his work; his hands must not be exposed to the risk of mutilation.

The following measures can be regarded as additional precautions for the safety of operators: (1) Automatic feeding and ejection, together with the suitable screening of the ram, so as to prevent the worker's hands from reaching a dangerous place; (2) limitation of the ram stroke to 8 or 10 mm.; (3) hand tools for feeding presses. These tools are for feeding and removing the work without its being possible to insert the hand under the ram. They can replace the hand guard only when their use is made absolutely compulsory. Even when such tools are used, the rear and the sides of the press should be protected by fixed screens. When machines are employed exclusively for hot stamping, suitable tools can be used instead of hand guards.

(4.) Installation of fixed guards that completely inclose the tools and entirely prevent the worker's hands from entering the danger zone. Among these guards may be included the so-called "closed tools," by which the operating point is completely covered; (5) movable guards that prevent the press from being started if the worker's hand is delayed on the lower die, and which cover the danger point as soon as, or before, the down stroke of the ram begins; (6) sweep-away guards that push the worker's hands out of the danger zone when the press starts; (7) tripping mechanism that requires the simultaneous use of both hands (two-handed controls). When in use they must make it impossible, or at least very difficult, for the hands to be placed or left in a dangerous position during the down stroke of the ram.

On slow-acting presses, the safety appliances must prevent the hands from being placed in a dangerous position after the press has been tripped. Broadly speaking, for quick-acting presses, fixed guards are preferable; for presses working at moderate speed, sweep-away guards; and for large, slow-acting presses, two-handed controls that automatically safeguard the hands by occupying them out of danger.

■

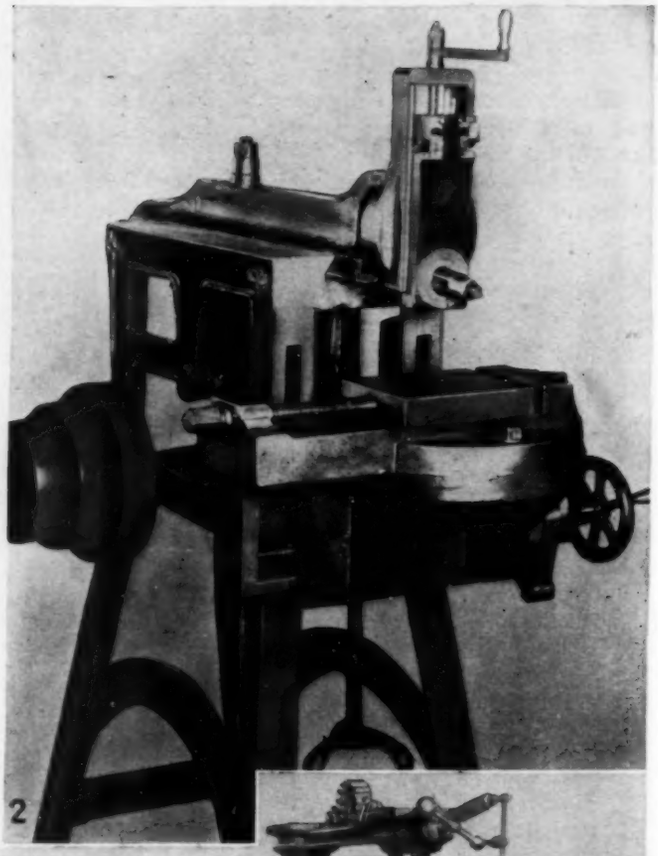
Soft Steel Gages—*Discussion*

WM. BRYCE
Sheffield, England

THE remarks of J. R. G., on page 294, Vol. 73, on soft steel gages are, as usual, very sensible and practical. For small shops, and others doing general work, soft steel gages and appliances are quite suitable. Indeed, many shops of this description have nothing else, while some foolishly struggle along without any at all. Though accurate repetition work on a large scale calls for hardened gages, they are frequently quite unnecessary. Extreme accuracy is not always a vital matter, much work being satisfactory if within a few thousandths. On jobbing work I keep within this limit by means of soft steel gages and jigs; I seldom trouble the toolroom for anything, making what is necessary. To have everything done through the toolroom often means delay and a lot of superfluous work. An ordinary carbon steel drill bushing will serve for hundreds of holes with neither hardening nor grinding, reducing jig and fixture expense without endangering accuracy.

Yesterday's Machine Tools

MACHINE TOOLS have been called the "master tools of industry," but few men, including the tool builders themselves, appreciate how fundamentally necessary they are to all industry. Without them, modern machinery could not be built. In fact, very little equipment preceded machine tools. Previous picture pages have shown early lathes and milling machines; here are shown certain additional units on exhibition at the Museum of Science and Industry of the City of New York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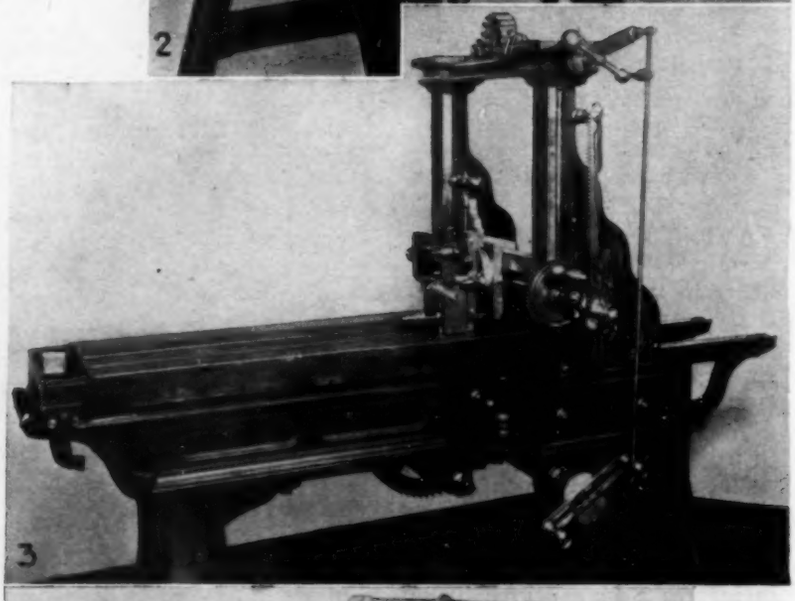
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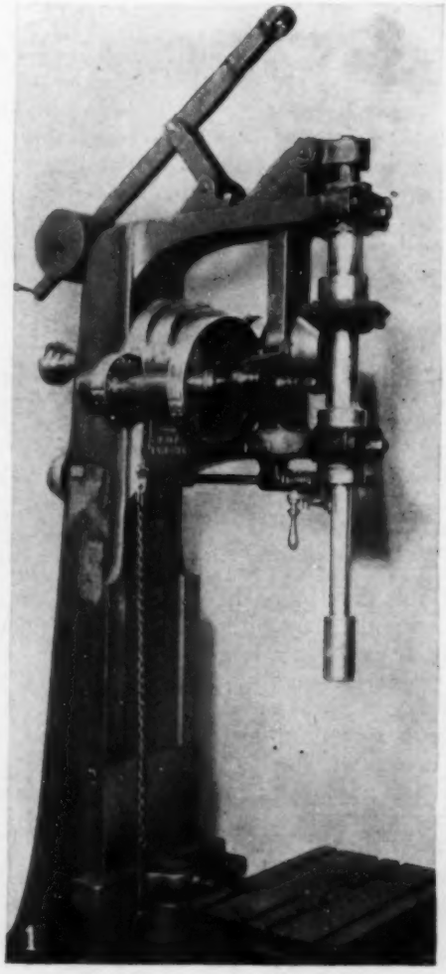
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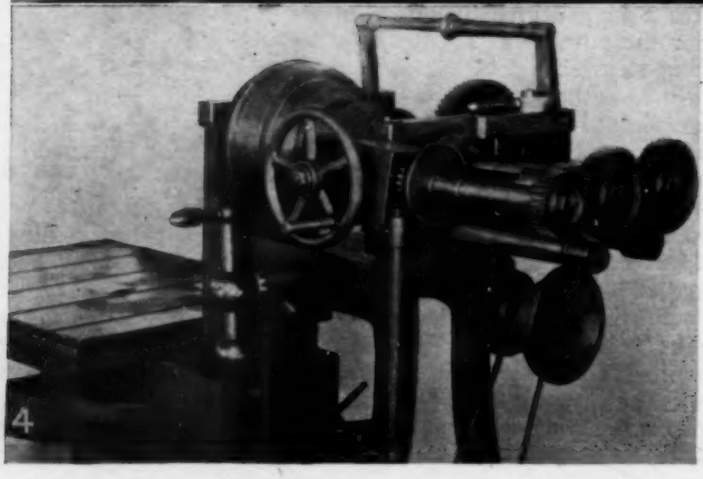
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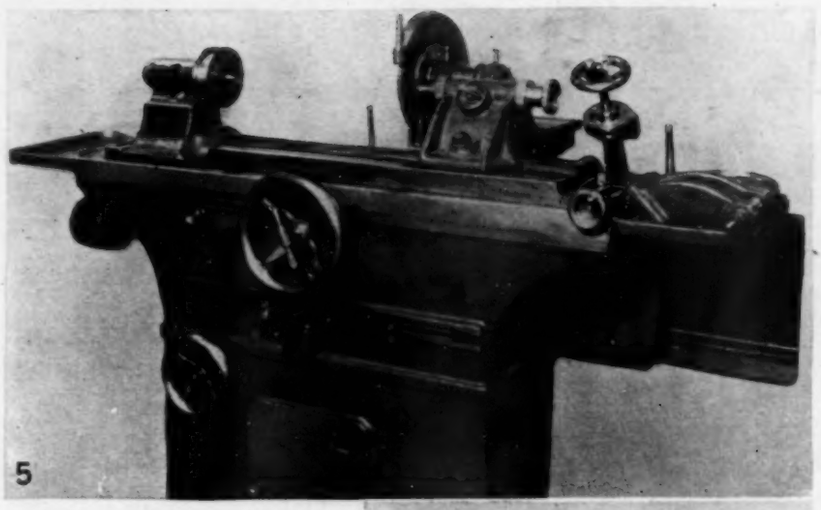


[1] An early Whitworth drill, brought to the United States from England about 1850. A gift of R. Hoe & Company to the Museum

[2] Gould shaper of about 1857; courtesy of Gould & Eberhardt

[3] A Putnam planer of about 1875, a beautiful example of the ornamental design then common. Courtesy of Manning, Maxwell & Moore

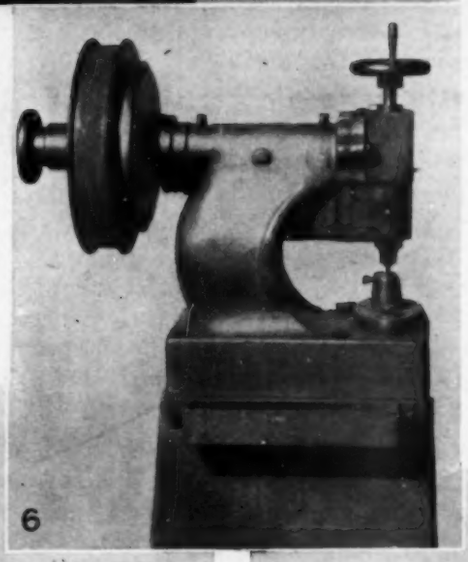
[4] A horizontal boring machine from the Gay & Silver Company shop, North Chelmsford, Mass. About 1850

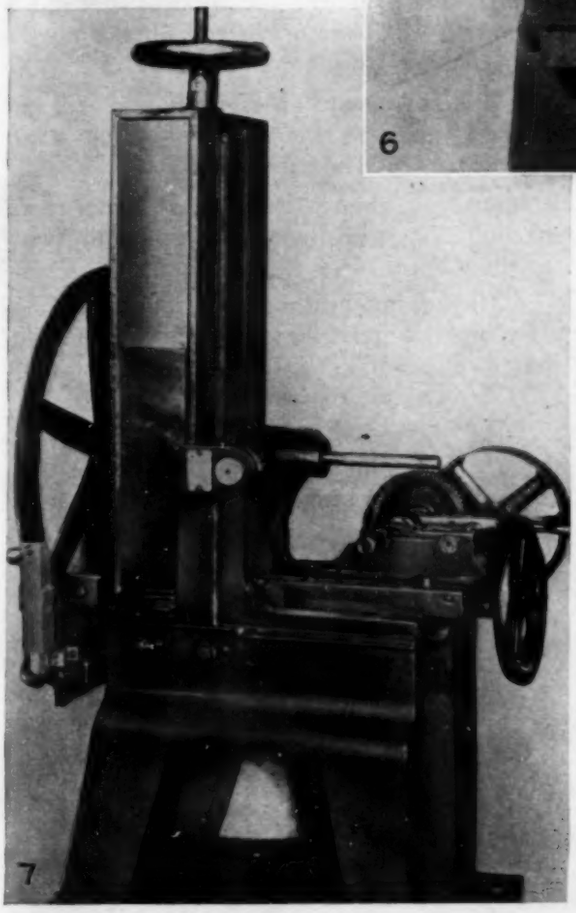
[5] The original Landis grinder, built by A. B. Landis in 1883. Courtesy of Landis Tool Company

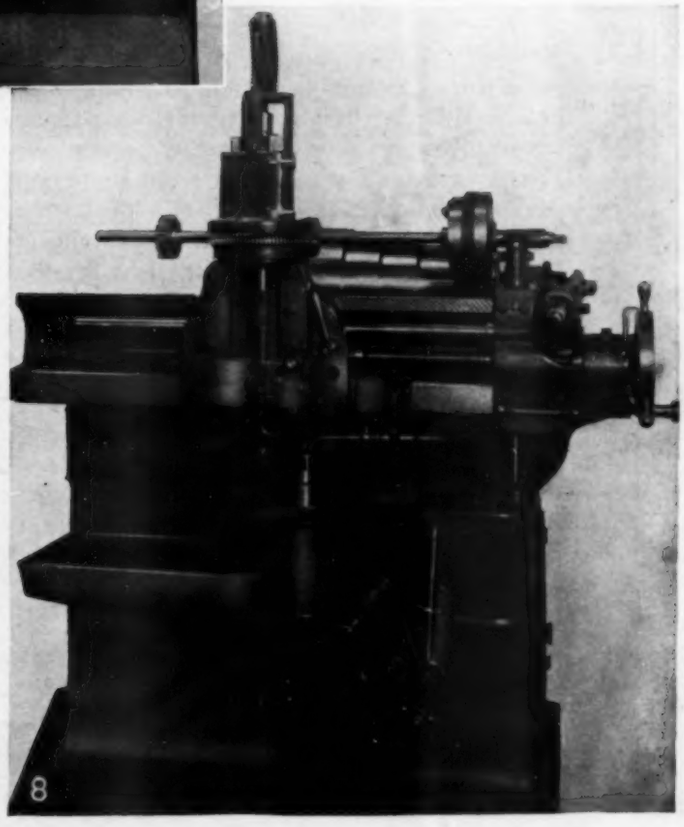
[6] The original nibbling machine; courtesy of Andrew C. Campbell, Inc.

[7] Gould gear cutter of about 1857; courtesy of Gould & Eberhardt

[8] The oldest Fellows gear shaper; courtesy of the Fellows Gear Shaper Company







The Foreman's Round Table

BAD DEBTS

"HOWDY, Ed," greeted Al as the two friends met leaving the factory. "What is the cause of the crowd I saw around the bulletin board when I came through your department? Do you post the winning policy numbers on the board?"

"Quit your fooling. None of my men play policy. That notice was another of Williams' accepted practice notices that I don't accept. How come you don't know about it? Didn't you get one?"

"Maybe it is among the letters I grabbed as I came out. I didn't get around to opening the last mail. Wait till I look. Yep, here it is. Shall I read it?"

"Not for me. It's all wrong. If a man owes a debt and won't pay it, he should be made to."

"Before committing myself to your gentle policy, I'll read it. 'At intervals we receive letters from various tradesmen asking our assistance in collecting a bill from some one of our employees. From copies of letters which they attach we notice that the intention to notify their employer of the debt is used as a threat. This company will not assume the position of bill collector and no employee need fear such a threat.

" 'Of course, we do not want men in our employ who deliberately contract debts with the intention of evading payment. Neither do we like to see the pay of honest men garnisheed. The point we wish to make is, that the company cannot be used as a club to compel the payment of debts.' Well, old stick-in-the-mud, what's wrong with that?"

"Everything. Every deadbeat in the country will be trying to work here. It puts a premium on dishonesty."

"You're way off, Ed. That notice is the result of a battle Williams had with the chief clerk and the personnel man. It seems that the letters Williams mentions were sent to the accounting department, and it, in turn, took the matter up with the personnel man, and he told the men they would have to pay. He didn't say that they would be fired, but he let them think it. I sent one of my men that they threatened to Williams and he went to the mat with the chief clerk and the personnel man. He told the big boss that in his opinion it was none of their business and was also contrary to company policy."

"Williams means all right, but he will get his neck in a sling if he doesn't look out. No one in the office has any use for him."

"Do you blame them? He wins every battle he has with them. He can think twice to their once."

"Maybe, but he thought wrong this time. If a man is garnisheed, the accounting department has to keep track of his pay, doesn't it? So why ain't it their business?"

"Ed, you're what is called a mental throwback. Your mind functions back in the time when men were sent to jail for debt."

" 'Back in the time?' Why, they do it today. If you don't believe it, stop paying your alimony."

"Does that help a man pay it? Can one of our men pay a debt, when he hasn't a job? Be your age, Ed."

Is Williams acting on sentiment or is his contention sound? Are men likely to take advantage of the firm's attitude?

Suggested by W. J. Owens, Foreman, Newport Rolling Mill Company

▸ ▸ ▸ Discussion of Former Topics

Trying His Wings

It is the easiest thing in the world to spend the money of some other man. One should be rather slow to advise another for or against setting up his own business. When a man asks for advice it is far better to show him both sides of the question impartially and let him make his own decision. Should he start his own business he will have to be making decisions all of the time anyway, so he should start off properly by making the first decision for himself.

After all, the advisor is not responsible; he has nothing at stake. He does not expect to participate in the profits nor is he willing to stand any of the losses. So he should refrain from making recommendations that he is not willing to back up financially. —L. O. Brown.

Age and Its Compensations

In speaking of the value of age in the shops, I do not want to undervalue or discourage the young man. We who are no longer youthful wish we could couple with our knowledge, gained from the school of years of experience, some of the enthusiasm with which a young man is fired as he takes up something new that appeals to him.

However, we know that, with the experience of time, the very thing that he is so enthused with today he may question or even oppose later on in life.

Probably a man is more reasonable in his thinking and living from about 30 to 55 than at any other time of his life.

The value of having men of mature age in the shop cannot be determined by their individual production. Their value is often in the influence they exert over the shop in general.

Usually, as a man reaches an age of maturity, he becomes more open minded, conscientious, loyal, and less impulsive or headstrong. He has got past the time when he thought he knew everything, and was ever ready to argue on work, sport, politics, and religion.

The presence of middle-aged men raises the whole environment of the shop, giving it a tone of stability and character, and there is far less playing about, agitation, and talk than there would be in a shop of younger men.

After sixty, there may be a tendency for a man to return again to the "know it all" style that he had in his twenties, but usually he will remain venerative, loyal, and conscientious.

The man in his sixties, if kept on the same or similar work to that he has always been used to, is usually more than a match for the younger man on the same job. On repetition work, especially, he is usually a plodder, whereas the younger man soon tires of constantly doing the same thing and wants to talk or take a walk around the shop.

The men in the shop often complain that the old men are fired, but are not they, and especially the younger ones, often to blame for this? So often it is considered great fun to tease the old men, and to avoid the excessive playing about, the foreman reluctantly discharges the old veterans, although he knows that they have been good, faithful, and conscientious. —Alfred Layzell.

Going Soft

Keeping all of the men on the job during slack times is far from being a solution to the unemployment situation. It is like trying to put a fire out with green coal. The fire smoulders for a short time and then it breaks out with renewed vigor. By this method the stock of commodities would be increased to such an extent that a shut down would be inevitable.

The old world is always changing. We are now passing through a period of readjustment. Modern machinery has replaced men in industry to such an extent that the situation is acute. The fact that these men are out of work tends to make matters worse, because their buying power is curtailed. But to keep all of them going would only result in more serious deflations. The only answer is shorter hours. Shorter working hours means a change in price as well as wages, all of which takes time. —W. J. Owens, *Foreman, Newport Rolling Mill Company.*

Whistlin' Willie

A foreman with any common sense at all will know when there is unnecessary noise or disturbance caused by carelessness and free will of the men. Under those conditions it becomes time for the foreman to play the part of a disciplinarian.

Whistling in the shop is unobjectional if indulged in moderately. However, in departments where skilled occupations are carried on, this rule should be more strictly enforced. Taking the toolmaker for an example, there are many times during the course of his work when he is in a pinch or when something goes wrong which causes him to work under a mental strain. Extra loud whistling at such times would be annoying.

—P. L. Budwitz.

By Their Presents

It frequently happens that an executive who does not approve of giving and receiving presents from shop acquaintances is put in an embarassing position by having one of his workmen offer him a present. Not wanting to offend, he will accept the gift. However, if the executive, upon receiving a present, will make it clear

that he does not approve of giving or receiving presents, he will not offend the giver and will not be offered presents in the future.

If it is right and proper for one employee to give to his superior, then all employees should give—and this would mean that some foremen would require a moving van to take their presents home.

I have watched this giving of presents in the factories, and in all cases the giver secretly brings his present to the foreman without telling his closest friend. Likewise, Mr. Foreman would take very good pains to cover up and not show that he had received a present. This, in my mind, is proof that the practice is wrong, and being wrong, a notice prohibiting it should be posted in a shop where it is practiced.

If this proves ineffective, then about one example, by the discharge route, will stop the practice.

—C. F. STAPLES.

Age and Its Compensations

As the value of labor depends on skill, experience, and knowledge of the work to be done, the rates paid must be directly related to these conditions.

Long service or seniority alone do not add materially to the value of a man's services. It is the skill and experience that is acquired by remaining with one employer that adds to a man's value up to a given point. A top rate usually exists on all jobs, and when this is reached added years do not justify more pay. Long service is most valuable when the force must be reduced, in which case it is customary to keep the men of long employment.

It is entirely fair and correct to set rates by groups, especially if a bonus system is being used. A value for a given group of jobs is established and applies to all working on these jobs. Skill and experience are expressed in speed, which brings a higher bonus.

A man should be paid what his services are worth at all times. If his classification limits his pay, it is time to promote him to better work or establish a higher class for the work he is on. This higher class should then become available to other high-grade men as they develop.

—L. F. SWENSON.

Mechanized

Before condemning general improvements and labor saving devices as means of promoting general poverty, it would be well to consider the matter in the light of past experience and in the light of our own observations. It is axiomatic that man's ability to receive the benefits mentioned above is directly proportionate to his ability to produce these benefits or to produce others which can be traded for the ones he desires. An improvement increases his productive power, for which he invariably receives an increased proportion of wages. As to what happens to those men who are thrown out of employment by any change, it has been observed that whatever unemployment occurs is purely temporary if considered from the long-run point of view. By lowering the cost of an article, the demand for it usually increases so that more men are finally required to produce the commodity in amounts that are necessary to fill the newly created demand. Thus, in the textile industry, more people are required today to fill the demand for textiles, because of the lower price, than were required when there was a great deal of hand labor. It should also be observed that changes are not so quickly affected as some historians would have us believe. The change-over from the old to the new is quite gradual. Thus, although the railroad was introduced at the beginning of the ninteenth century, it was well toward the last of it that the death-cry of the stage coach was heard.

We might profit by the Biblical example of storing the surplus grain from the prosperous years for the seven years of famine. The average man is apt to forget to store enough of his wages during a good business period to even up for the poor years. The high-wage, high-consumption theory is sound only when the consumption is no higher than an average of the person's consumption as compared to his average earnings during his whole life is considered. The resulting consumption would of course be lower in times of high prosperity, but in the long run it would be the same. It would have much to do with evening the business cycle.

—MILLARD F. SAXTON,
Allis-Chalmers Manufacturing Company.

Who's Who In Industry

While functionalizing does help to secure efficiency, it cannot be used universally. Shops where functionalizing is of great benefit are those which manufacture standard articles, the whole plant being kept continuously in operation. Any alteration in any department will only upset the functionalizing until the plant settles down again. For shops which manufacture non-standard articles for which there is a fluctuating demand, functionalizing cannot be recommended. Functionalizing a department is simple when compared to the functionalizing of a plant; a department is concerned with one product only, whereas with a plant there are several departments whose interests, to some extent, conflict. There are also the maintenance and testing departments which do not lend themselves to functionalizing.

—W. E. WARNER, *Herts, England.*

By Their Presents

The practice of giving presents is wrong by any standard, as it means paying tribute and assumes that something of value will be received in return.

In some places the giving of gifts is part of the daily life, nearly everyone, from the super to the foreman, being "greased." In some cases the foreman receives all the wages and pays the men, less his graft. More commonly he collects a fixed sum, every pay day, from each man. Some cases of direct payment are found in this country, but we usually prefer the indirect method of giving presents.

While working for a large corporation I received a set of rules of conduct in which I was specifically forbidden to borrow money or receive it from men under me, or to receive presents. Children take apples to the school teacher so that she will take a more kindly interest in them, and men buy cigars and neckties for the boss, but considered from a moral standpoint gifts harm both giver and recipient.

—JOHN S. ISDALE, *Plant Engineer, International Silver Company.*

Links and Link Tools

W. H. MALLIET
Supervisor of Design and Development The Royal Typewriter Company

MANY links used in small machines require bending and shearing to shape, for clearance and for accuracy. An example of a link of this type is seen in Fig. 1. For the final operation on this link, a shearing punch and die illustrated in Fig. 2 are required. The punch shears simultaneously the inside end of the loop and the two sides of the loop. A slide operated by a cam finger attached to the punch pushes against the loop of the link and positions it on the stripper prior to shearing. Since the stripper is delicate, half dozen should be made at the same time to reduce cost of replacement.

Attention is called to the construction of the die with its insert. This insert should also be made up in small lots to save cost and prevent delay in the work. An enlarged plan view of the punches shows the provision for grinding. This also indicates how the lower ends can enter the die and be supported by it before the shearing takes place.

If the link has only to be sheared on the inside end of the loop and on one side, as in Fig. 3, a simpler and less expensive punch and die can be constructed. (Fig. 4.) In this die, a spring pressure-block is used to hold the part down before and while the shearing action is taking place.

When the link is of a small diameter wire, say 0.059 in., and subject to a heavy pull the loop may be bent and its back swaged at the same time as in Fig. 5. The detail at *A* shows a section through the center of the punch and die. One of the slides is shown at the center of this view. Two of these slides are required to do the pinching or swaging. Underneath the slide is a circular hardened tool steel anvil die held in with one screw and a dowel. These anvil dies are made small for easy replacement when they wear sufficiently to make this necessary. A spring stripper is utilized to hold the wire link in the form for locating it properly. Prior to this bending and swaging operation, the end of the link is given an offset and the opposite end is bent.

In the rear of this section is another spring slide which acts as a punch and bends the loop end down before it is swaged. For this bending operation, the punch proper is made as a separate plate so that it may be replaced for wear which is rather severe at the bending point. The view at *B* shows the outer end of one of the slides projecting. A spring returns it to a clearance position after the swaging operation. These slides are actuated by the hardened head of a screw in the punch holder through the medium of a flat rocker lever. The rocker lever, which is pivoted

The second of two articles. The first appeared last week.

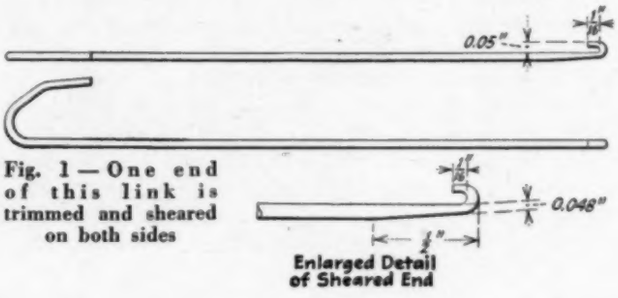
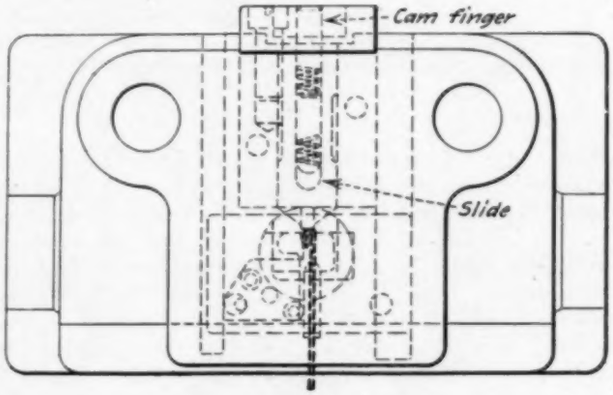
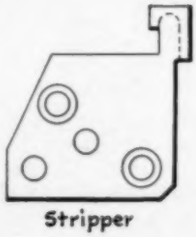


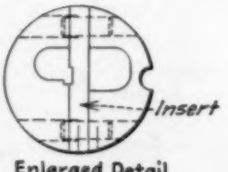
Fig. 1—One end of this link is trimmed and sheared on both sides

Enlarged Detail of Sheared End





Stripper

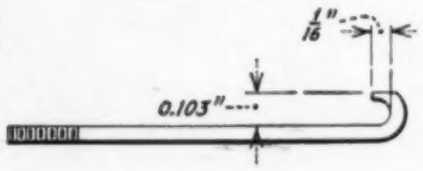


Enlarged Detail of Die and Insert

Enlarged Detail of Shearing Punches

Fig. 2—A cam actuated slide clamps the link while a double punch performs all operations simultaneously

Fig. 3—Another style of link is sheared on one side only



between the two posts, operates in a clearance slot in the center of the slide. One post is located on each side of the die head.

The die-set in Fig. 6 illustrates one view of a punch and die for the assembly of a pendant to a wire link. Before the pendant is assembled, it is necessary to offset the link at the assembly point and to form the pendant as at *A*. The link with the pendant placed in the offset is positioned on the die with locators for each part. In operation, the slide *B* in the punch contacts with the pendant and holds it in position while the forming fingers *C* push over the end of the pendant. This enables the punch blades *D*, with their half circular forms, to clamp the pendant firmly around the offset in the wire link.

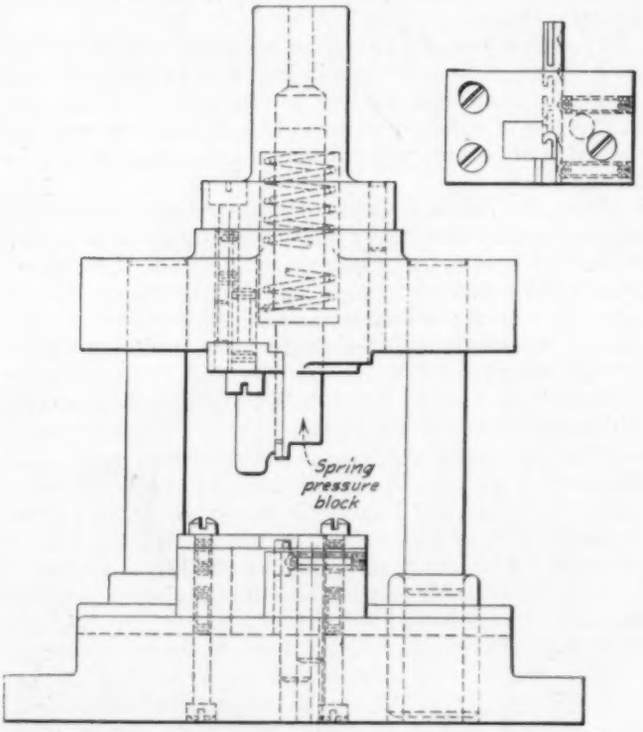


Fig. 4—A simpler die design uses a pressure block to hold the work

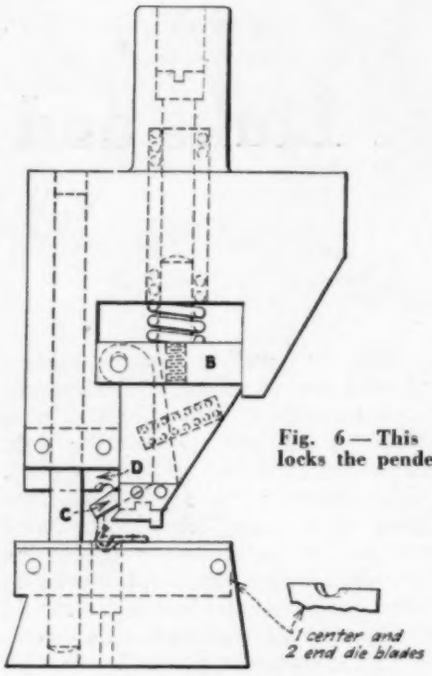
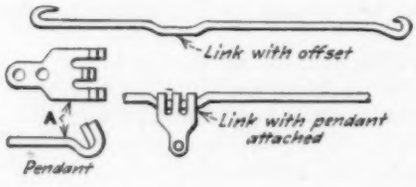


Fig. 6—This assembly die locks the pendent to the link



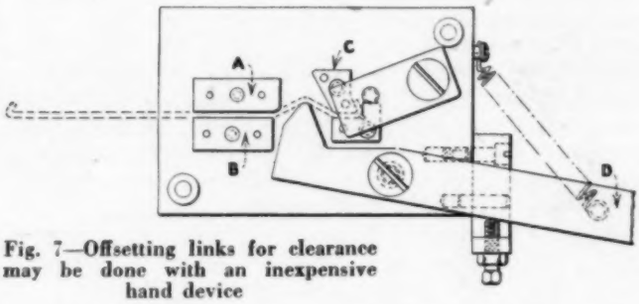
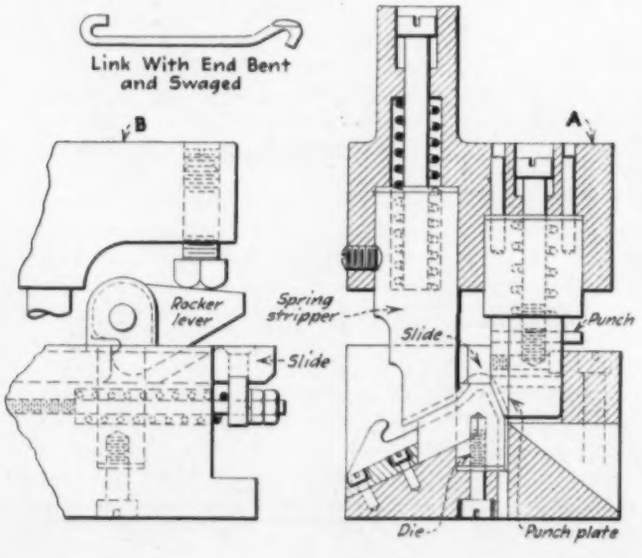


Fig. 7—Offsetting links for clearance may be done with an inexpensive hand device

Fig. 5—An ingenious die set bends and swages in one operation



Three inserted blocks, about $\frac{3}{32}$ in. thick, are used in making up the die while five blocks are used for the punch for cheapness in replacing them when they wear.

If a link, as at *A*, Fig. 7, has to have an offset for clearance this offset may be given by the simple bench tool shown. The link is placed in position in the nest plates *A*, *B* and *C*. Pulling the handle *D* makes the form shown. In making this bend, some of the link projecting at the left is pulled through the gage plates *A* and *B*. A spring is utilized to return the bending lever to a clearance position so another link may be inserted for bending.

■

A new white cast iron has been developed which can be nitrided. This must be annealed in accordance with the usual malleable process and then machined or ground before nitriding. It is suggested that this might be an ideal material for ways and slides.

IDEAS FROM PRACTICAL MEN

Experimental Blanks for Drawing

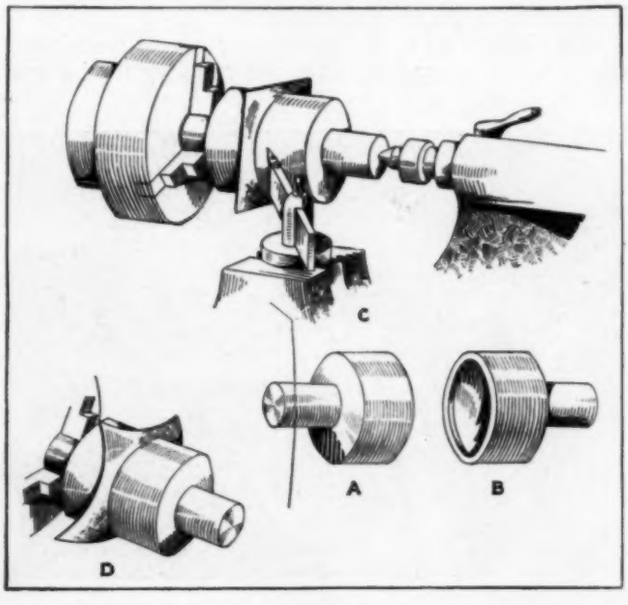
CHARLES H. WILLEY
Assistant Plant Superintendent, Hoyt Electrical Works

I HAVE noticed in the pages of the *American Machinist,* from time to time, some of the methods described by toolmakers for cutting out experimental disks for drawing. Lately, I hit upon a simple method of producing such disks, and now wonder why I had never thought of it before.

We recently needed a lot of round blanks, ranging in diameter from 4 to 6⅛ in., for experimental work in determining the proper diameters of blanks for drawing certain cups for instrument cases. Castings such as are shown at *A* and *B* were made and were machined all over, the larger part of *A* being of the diameter of the largest blank wanted, and the diameter of *B* was ⅛ in. less. While the face of *A* was flat, the face of *B* was recessed in the center, leaving a raised rib at the outside.

The material for the blanks was 0.025-in. deep-drawing brass, and was cut up into squares of the proper sizes. With the castings and the squares of brass held in the lathe, as shown at *C*, and with the corners of the brass bent away from the tool, as at *D*, it was a simple matter to turn off the corners and to trim the blank to the diameter of the casting *A*. The recess in casting *B* was for the purpose of allowing the blank to be gripped firmly by the rib. A ball-bearing center was used in the tailstock to lessen the friction of rotation.

Any quantity of blanks can be cut out by this method.



When smaller blanks are required, the castings can be reduced in diameter to suit. When casting *B* has been reduced so the rib is too narrow, it can be refaced and again recessed. If it desired to cut out blanks of heavy metal, the parts *A* and *B* can be made of steel, knurling their faces to obtain a better grip.

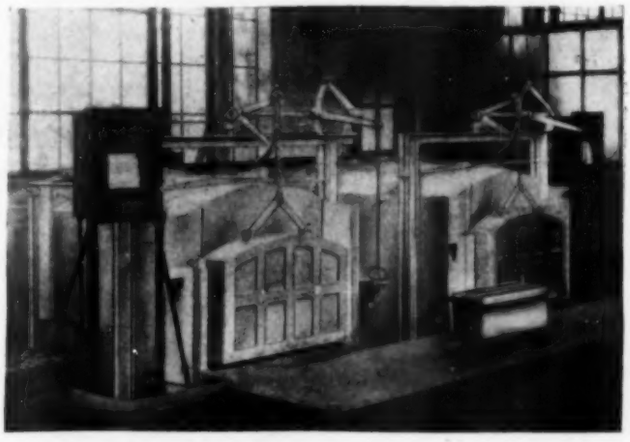
[EDITOR'S NOTE—It would seem as if blanks of such thin material could be produced more quickly and cheaply by the use of circular slitting shears used by tinsmiths for cutting out such parts as can bottoms. Blanks of a large range of sizes can be cut, and the shears can be quickly adjusted to the size wanted.]

Floor Level Hearths

E. L. MARKS

Material handling may often be improved just as much as any other shop activity. It should be given particular attention when installing new equipment as a little planning at that time may save needless effort over a period of years.

A case in point is the furnace installation at the

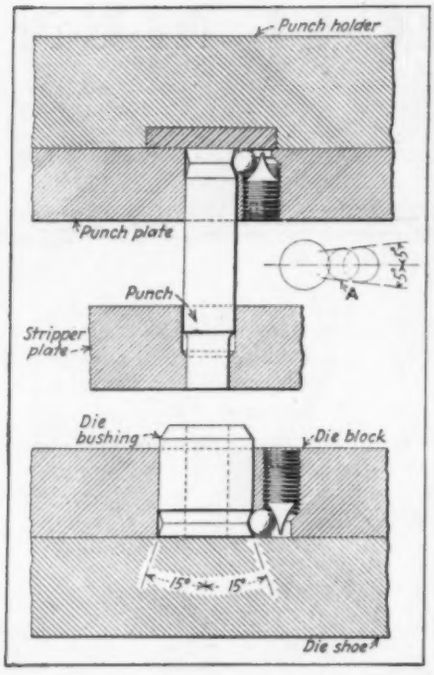


Ex-cell-o Aircraft and Tool Corporation. These furnaces are sunk in pits so their hearths are flush with the floor level. Boxes full of parts to be heat-treated are simply pushed into the furnaces and removed as easily after treatment. This arrangement saves lifting devices, overhead runways, and the like.

Removable Punches and Dies

C. W. HINMAN
Chief Tool Designer, Kobzy Tool Company

If it is necessary from any cause to remove either of the large perforating tools, weighing some 500 lb., the method of holding shown in the illustration will save much exasperation, time, and money. The method is



applicable to any punch-holder or die-block in which perforating tools are held.

A hole is drilled and tapped in the punch plate so as to leave a wall $\frac{1}{16}$ in. thick between it and the hole for the punch. This wall is partly cut away to permit the entrance of a $\frac{1}{4}$-in. ball (or a pin roller if preferred), the sides being sloped at an angle of 5 deg., as shown at *A*, to permit the ball to protrude less than half its diameter into the hole for the punch. A pointed screw forces the ball against the punch, holding it tightly. The punch has an angular groove turned in its shank, so that the ball will force it upward against a hardened disk let into the punch-holder. The screw will not be loosened by vibration, because the pressure against the ball forces it sidewise, the action being the same as that of a side lock.

The die-block and the die-bushing are treated in the same manner. Slightly more than one turn of either of the screws will permit the punch, or the die-bushing to be removed and another member quickly substituted, without taking either the punch-holder or the die-block from the press. Another advantage of this method of holding is in the ease by which the punches or die-bushings can be located on close centers, even though the members must be "flatted" together. The locking screws can be placed in any position around the member to be held, to avoid interference and to suit individual cases. The ball cannot fall on the wrong side of the point of the locking screw, because the threaded portion of the tapped hole ends at the center of the ball, while the tap-drill size only of the hole is continued through.

■

Rigid Feed-Attachment for the Drill Press—*Discussion*

T. Smith
Sutton in Ashfield, England

The device described by Harry Moore in an article under the title given above, on page 633, Vol. 73, of the *American Machinist*, is very good and I will give it a trial. We have three sensitive drills in constant use, and the device can be tried on two of them. The position of the lever on the third drill is such that the method can not be used on it.

We make a very large quantity of perforating dies for our own use, the holes being $\frac{1}{16}$ and $\frac{5}{64}$ in. respectively. Like Mr. Moore, we were troubled with drill breakage, the breakage being mainly due to two causes: feeding too fast with too slow speed of the drill, and not keeping the spindle adjusted to prevent it from dropping when the point of the drill came through the work, resulting in a broken drill. In talking over the matter with the man who made the dies, he suggested that the hole be not drilled quite through, but that we set the spindle stop to contact $\frac{1}{64}$ in. before the point of the drill came through, then put the work into the lathe and face off the undrilled portion. We tried this and the results were better, but we still had a few breakages, which were lessened by increasing the speed of the drill.

Facing off the undrilled portion of the work was not always convenient, owing to the lathes being tied up with other work. We next tried another method, giving us results similar to those obtained by Mr. Moore. Having taken up the backlash in the spindle, we fitted a stop that was opposed by a compression spring, which prevented the drill from coming through suddenly. But the operator had a brain wave. He attached his No. 64 Starrett universal test indicator to the table, setting it so that the spindle stop touched it just before the drill point came through the work. By watching the indicator he was able to feed very slowly, the spring opposing the stop being of help. This method is proving very successful, the reason being, of course, that the operator is watching the feed more closely just before the drill breaks through. Both of the methods mentioned are simple and will give good results.

■

Convexities and Concavities—*Discussion*

Matthew Harris

The ingenious device for turning spherical surfaces, too fast with too slow speed of the drill, and not keeping the *American Machinist*, reminds me of a device for turning the spherical joints on the steam pipes of Mallet locomotives, in use in the Chesapeake & Ohio R.R. shops at Huntington, West Virginia. In Fig. 1 the device is shown with a finished joint in place, while in Fig. 2 it is shown with the pipe removed.

The pipe is held at one end in an ordinary four-jawed chuck, and is supported at the outer end by the internal

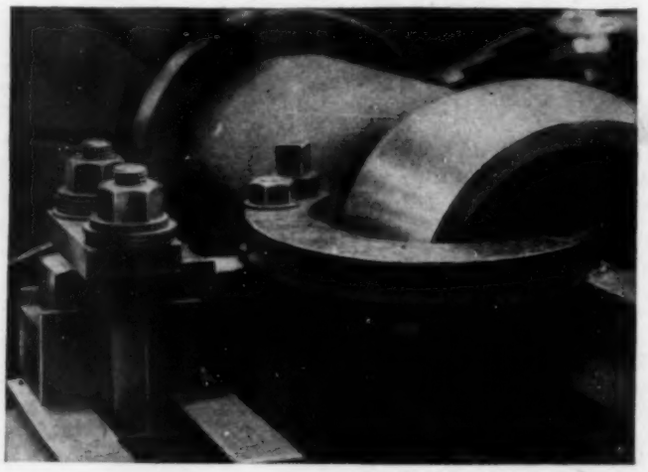


Fig. 1

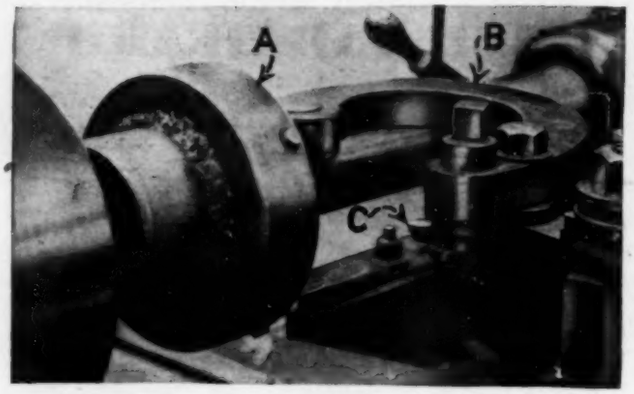


Fig. 2

spider chuck *A*, Fig. 2, which in turn is supported by a bar held in the tailstock spindle. The screws in the spider chuck pass through an annular flange, and the heads can be readily reached from the inner wall. The curved lever *B* is pivoted at one end to bar in the tailstock, and near the other end to a bar held in the toolpost, the toolbit *C* being held close to the latter pivot and underneath the curved lever.

In operation, with the pipe in place, and with the cross-feed mechanism disengaged, the bar in the tailstock is advanced until the pivot is in the center of the partial sphere to be turned. It will be seen that as the carriage travels along the lathe bed, the toolbit will follow a circular path, the radius of which is governed by the center distance of the pivots and the distance the toolbit projects from its holder. The lever is curved so that it will not interfere with any part of the work during the operation. Depth of cut is controlled by setting the toolbit in or out of its holder.

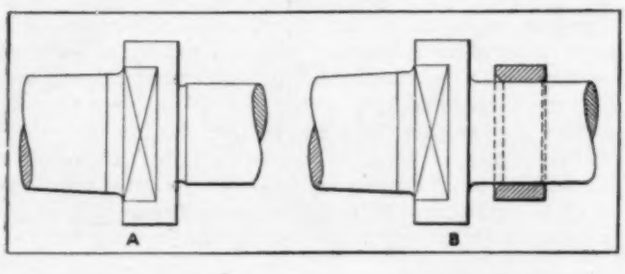
■

Necking for Grinding—*Discussion*

T. Greening
Coventry, England

Referring to the article under the title given above, by J. T. Towlson, on page 713, Vol. 73, of the *American Machinist*, it seems to me that the method shown at *C* does not give the necessary clearance, as the shoulder only is recessed and so necessitates the use of a grinding wheel having a sharp corner. A combination of Mr. Towlson's *B* and *C*, as shown in the sketch *A* herewith, is not a bad way of dealing with corners that require to be ground. The reduction of diameter in the work being just below the finished size should not cause appreciable weakness. This neck gives the grinder a fair amount of latitude as regards wear on the corner of his wheel.

In regard to cutter arbors specifically, why neck them at all? Our practice is to leave a small fillet, as shown in sketch *B*. The fillet adds to the strength of the arbor and does not complicate the grinding too much. A special collar chamfered to clear the fillet only is required, and if this collar is a light drive fit on the arbor, there will be no danger of its being misplaced.



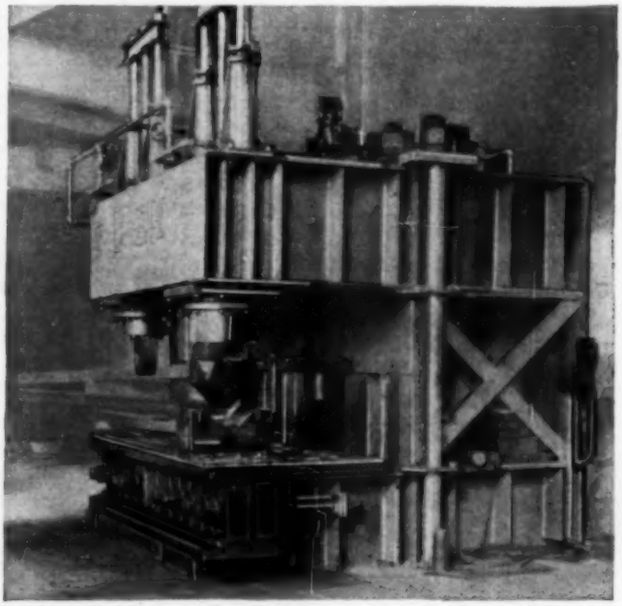
■

Hydraulic Press Welded From Structural Shapes

Oliver Franklin

In a structural shop handling a wide variety of work and general jobbing as well, a universal hydraulic press is a handy piece of equipment. Not being able to find such a machine on the market for hot work, such as bending beams, the Lakeside Bridge & Steel Company, Milwaukee, Wis., proceeded to build its own. Expensive patterns and heavy castings were out of the question, so that resort was made to a design in which welding would play a prominent part.

The photograph shows the completed press. It has



two vertical rams, operated independently, and one horizontal ram used as a bulldozer. Each ram is actuated hydraulically, producing 30 tons pressure with 500 lb. per sq.in. in the system, and 120 tons with a pressure of 2,000 lb. per sq.in. A motor-driven triplex plunger pump furnishes the hydrostatic pressure. The entire hydraulic system, including pump and rams, is a purchased unit.

The overhead structure is built up of a group of four 30-in. I-beams, reinforced at intervals with cross webs welded in place. Similar construction is employed for the lower frame which is tied to the upper through structural columns and cross members. To resist the upward reaction of the rams, six vertical tie rods have been built into the machine, two of them 5½ in. in diameter, and four of them 4 inches. Eight horizontal tie rods take the bulldozer reaction through an H-section

beam strengthened by 13 welded-in web plates on each side, and located under the front edge of the bolster plate.

While welding was used practically throughout. In many places the assembly bolts were left in position, but in a few instances the bolts were withdrawn and the holes filled by welding.

■

An Accurate Depth Stop

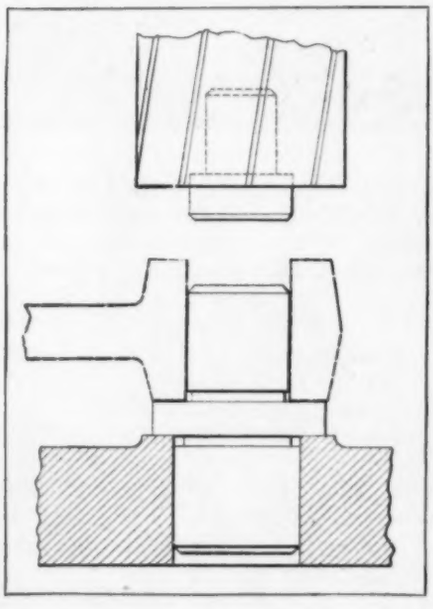
TOM WRIGLEY
Cartiersville, Quebec, Canada

Many drill presses are equipped with some sort of tripping devices that limit the depth of cut. Such devices have at some time or other made the operator swear, due to their failure to function properly. A simple and accurate depth stop for work of a certain class is shown in the illustration.

Where one end of the hub of a level is to be faced, a plate carrying a hardened shoulder pin is attached to the table of the drill press, the center of the pin being directly under the center of the machine spindle. The diameter of the pin is such that it is an easy fit in the hole in the hub, and its length is $\frac{1}{4}$ in. shorter than the finished length of the hub. The counterbore, or facing tool, has a pilot of the same diameter as that of the pin in the plate, and projecting $\frac{1}{4}$ in. beyond the cutting face of the counterbore.

In operation, the hub of the lever is slipped over the pin, and the counterbore is fed to the cut by hand. When the pilot in the counterbore comes into contact with the pin in the plate, the downward movement of the spindle is arrested and the counterbore ceases to cut.

Where both ends of the hub are to be machined, two pins are carried in the plate, being far enough apart to prevent interference with the work. The first pin is $\frac{1}{16}$ in. or more higher than the second one, depending upon the amount of metal to be removed in the second operation. The height of the second pin added to the amount the pilot projects from the cutting face of the counterbore will be the finished length of the hub.



In operation, the first pin is set in line with the spindle, and the hubs of the whole batch of levers are faced on one end. The plate is then moved so that the second pin is in line with the spindle. The facing operation is then repeated on the opposite ends. There is no necessity for the operator to worry about the accuracy of the work, providing he keeps the ends of the pin and pilot clean.

SEEN AND HEARD

●

Importance of Smooth Bearings

SMOOTHNESS of bearing surfaces is most important if a machine is to have a long life. Even though bearings seem smooth and crankshafts appear to be perfect, there are thousands of minute high spots that must be worn down before the engine or machine is at its best. A testing engineer in a high-grade motor plant who was curious to know just what happened, put a powerful electromagnet in the oil sump of a new engine on the test block. When he took it out after an hour's run it was so covered with small particles of steel that he stopped production until he consulted the big boss. The crankshafts seemed to be as good as usual but here was evidence that the high spots were being worn off rapidly and that the small particles of steel were going through all the bearings, where, of course, they acted as an abrasive. It was decided that there was nothing to do but resume production but every effort was made to produce the smoothest shafts possible, even at the cost of more operations and more care in each. It's mighty hard to make a shaft too smooth or too true. —*J.R.G.*

Sensitive Milling

I SAW a couple of machines the other day. The Keller Mechanical Engineering people had them on the floor getting them ready for an exhibition somewhere in Europe. The Keller die-sinker is an old story, but these two particular machines, each by a different method, had an unloading device that I thought distinctly good.

On one machine, a $\frac{3}{4}$-in.-diameter end mill was taking a $\frac{3}{4}$-in.-deep cut, in a high-carbon die block. It was revolving at 700 r.p.m. and feeding at about 0.800 in. per min. Regardless of the hard spots or dulling of the cutter the operator does not reduce either speed or feed. The machine does this automatically. If the cutter strikes a hard spot, the feed slows up and keeps just the same strain on the spindle that it did in the soft part; when the hard spot is passed it feeds faster again. The same thing is true when the cutter becomes dull. The feed slows down to accommodate itself to the condition of the cutter.

The mechanism and its operation is simple. A power limit relay is set so that it will operate when the current used exceeds a set amount. The relay operates a magetic clutch, and throws it in and out to maintain the proper strain against the cutter. Doing this gives a faster average feed and grindings that are further apart.

The other machine was the other extreme in size. It was using an 0.080-in. end mill and cutting $\frac{3}{32}$ in. deep. The feed was 0.062 in. and the speed 10,000 r.p.m. The same general arrangement, but secured by a different method, kept the cutter up to full cutting speed but prevented its breaking.

The problem here was not to take care of the cutter in hard spots or when it became dull, but to protect it all the time from the momentum of the relatively massive machine behind it. Milling cutters are expensive. Limiting them to a safe speed is cheapest in the long run.

Consecutive Number Factors for Change Gear Calculation—II

Computed by Sam Trimbath for calculations shown on page 403 of the preceding number

1462	$2x17x43$	1786	$2x19x47$	2183	$37x59$	2580	$2^2x3x5x43$	3015	3^2x5x67	3481	59^2	3999	$3x31x43$
1463	$7x11x19$	1804	$2^3x11x41$	2184	$2^3x3x7x13$	2581	$29x89$	3016	$2^3x13x29$	3483	3^4x43	4000	2^5x5^3
1464	2^3x3x61	1805	$5x19^2$	2185	$5x19x23$	2583	3^2x7x41	3024	2^4x3^3x7	3484	$2^2x13x67$	4004	$2^2x7x11x13$
1474	$2x11x67$	1806	$2x3x7x43$	2196	2^2x3^2x61	2584	$2^3x17x19$	3025	5^2x11^2	3485	$5x17x41$	4005	3^2x5x89
1475	5^2x59	1824	2^3x3x19	2197	13^3	2585	$5x11x47$	3026	$2x17x89$	3486	$2x3x7x83$	4025	5^2x7x23
1476	2^2x3^2x41	1825	5^2x73	2200	2^3x5^2x11	2596	$2^2x11x59$	3059	$7x19x23$	3509	11^2x29	4026	$2x3x11x61$
1479	$3x17x29$	1826	$2x11x83$	2201	$31x71$	2597	7^2x53	3060	2^2x3^2x5x17	3510	$2x3^3x5x13$	4028	$2^2x19x53$
1480	2^3x5x37	1827	3^2x7x29	2204	$2^2x19x29$	2600	2^3x5^2x13	3068	$2^2x13x59$	3519	$3^2x17x23$	4029	$3x17x79$
1484	2^2x7x53	1829	$31x59$	2205	3^2x5x7^2	2601	3^2x17^2	3069	$3^2x11x31$	3520	2^6x5x11	4030	$2x5x13x31$
1485	3^3x5x11	1830	$2x3x5x61$	2208	2^5x3x23	2622	$2x3x19x23$	2071	$37x83$	3525	$3x5^2x47$	4046	$2x7x17^2$
1494	$2x3^2x83$	1845	3^2x5x41	2209	47^2	2623	$43x61$	3072	$2^{10}x3$	3526	$2x41x43$	4047	$3x19x71$
1495	$5x13x23$	1846	$2x13x71$	2210	$2x5x13x17$	2624	2^6x41	3074	$2x29x53$	3549	$3x7x13^2$	4048	$2^4x11x23$
1496	$2^3x11x17$	1848	$2^3x3x7x11$	2211	$3x11x67$	2625	$3x53x7$	3075	$3x5^2x41$	3550	$2x5^2x71$	4059	$3^2x11x41$
1500	2^2x3x5^3	1849	43^2	2212	2^2x7x79	2627	$37x71$	3080	$2^3x5x7x11$	3551	$53x67$	4060	$2^2x5x7x29$
1501	$19x79$	1850	$2x5^2x37$	2225	5^2x89	2628	2^2x3^2x73	3081	$3x13x79$	3552	2^3x3x37	4070	$2x5x11x37$
1504	2^5x47	1855	$5x7x53$	2226	$2x3x7x53$	2639	$7x13x29$	3082	$2x23x67$	3553	$11x17x19$	4071	$3x23x59$
1505	$5x7x43$	1856	2^6x29	2231	$23x97$	2640	$2^4x3x5x11$	3104	2^5x97	3564	2^2x3^4x11	4080	$2^4x3x5x17$
1512	2^3x3^3x7	1859	$11x13^2$	2232	2^3x3^2x31	2645	$5x23^2$	3105	3^3x5x23	3565	$5x23x31$	4081	$7x11x53$
1513	$17x89$	1860	$2^2x3x5x31$	2233	$7x11x29$	2646	$2x3^3x7^2$	3115	$5x7x89$	3569	$43x83$	4087	$61x67$
1517	$37x41$	1862	$2x7^2x19$	2240	2^6x5x7	2655	3^2x5x59	3116	$2^2x19x41$	3570	$2x3x5x7x17$	4088	2^3x7x73
1518	$2x3x11x23$	1863	3^4x23	2241	3^3x83	2656	2^5x83	3127	$53x59$	3588	$2^2x3x13x23$	4089	$3x29x47$
1519	7^2x31	1869	$3x7x89$	2242	$2x19x59$	2664	2^3x3^2x37	3128	$2^3x17x23$	3589	$37x97$	4094	$2x23x89$
1520	2^4x5x19	1870	$2x5x11x17$	2254	$2x7^2x23$	2665	$5x13x41$	3135	$3x5x11x19$	3599	$59x61$	4095	$3^2x5x7x13$
1521	3^2x13^2	1875	$3x5^4$	2255	$5x11x41$	2666	$2x31x43$	3136	2^6x7^2	3600	$2^4x3^2x5^2$	4096	2^{12}
1533	$3x7x73$	1876	2^2x7x67	2256	2^4x3x47	2679	$3x19x47$	3145	$5x17x37$	3618	$2x3^3x67$	4107	$3x37^2$
1534	$2x13x59$	1880	2^3x5x47	2257	$37x61$	2680	2^3x5x67	3146	$2x11^2x13$	3619	$7x11x47$	4108	$2^2x13x79$
1536	2^9x3	1881	$3^2x11x19$	2261	$7x17x19$	2697	$3x29x31$	3149	$47x67$	3625	5^3x29	4130	$2x5x7x59$
1537	$29x53$	1885	$5x13x29$	2262	$2x3x13x29$	2698	$2x19x71$	3150	$2x3^2x5^2x7$	3626	$2x7^3x37$	4131	3^3x17
1539	3^4x19	1886	$2x23x41$	2263	$31x73$	2700	$2^2x3^3x5^2$	3159	3^3x13	3627	$3^3x13x31$	4147	$11x13x29$
1540	$2^2x5x7x11$	1887	$3x17x37$	2277	$3^2x11x23$	2701	$37x73$	3160	2^3x5x79	3648	2^6x3x19	4148	$2^2x17x61$
1541	$23x67$	1888	2^5x59	2278	$2x17x67$	2703	$3x17x53$	3179	$11x17^2$	3649	$41x89$	4160	2^6x5x13
1547	$7x13x17$	1890	$2x3^3x5x7$	2279	$43x53$	2704	2^4x13^2	3180	$2^2x3x5x53$	3650	$2x5^2x73$	4161	$3x19x73$
1548	2^2x3^2x43	1891	$31x61$	2280	$2^3x3x5x19$	2716	2^2x7x97	3185	$5x7^2x13$	3654	$2x3^2x7x29$	4182	$2x3x17x41$
1550	$2x5^2x31$	1892	$2^2x11x43$	2294	$2x31x37$	2717	$11x13x19$	3186	$2x3^3x59$	3655	$5x17x43$	4183	$47x89$
1551	$3x11x47$	1908	2^2x3^2x53	2295	3^3x5x17	2736	2^4x3^2x19	3195	3^2x5x71	3657	$3x23x53$	4185	3^3x5x31
1552	2^4x97	1909	$23x83$	2296	2^3x7x41	2737	$7x17x23$	3196	$2^2x17x47$	3658	$2x31x59$	4186	$2x7x13x23$
1580	2^2x5x79	1924	$2^2x13x37$	2299	11^3x19	2738	$2x37^2$	3200	2^7x5^2	3685	$5x11x67$	4187	$53x79$
1581	$3x17x31$	1925	5^2x7x11	2300	2^2x5^2x23	2739	$3x11x83$	3201	$3x11x97$	3686	$2x19x97$	4199	$13x17x19$
1586	$2x13x61$	1935	3^2x5x43	2301	$3x13x59$	2744	2^3x7^3	3211	13^2x19	3689	$7x17x31$	4200	2^3x3x5^2x7
1587	$3x23^2$	1936	2^4x11^2	2303	7^2x47	2745	3^2x5x61	3212	$2^3x11x73$	3690	$2x3^2x5x41$	4224	2^7x3x11
1590	$2x3x5x53$	1943	$29x67$	2304	2^8x3^2	2754	$2x3^4x17$	3213	3^3x7x17	3712	2^7x29	4225	5^2x13^2
1591	$37x43$	1944	2^3x3^5	2324	2^2x7x83	2755	$5x19x29$	3219	$3x29x37$	3713	$47x79$	4232	2^3x23^2
1595	$5x11x29$	1952	2^6x61	2325	$3x5^2x31$	2756	$2^2x13x53$	3220	$2^2x5x7x23$	3717	3^2x7x59	4233	$3x17x83$
1596	$2^2x3x7x19$	1953	3^2x7x31	2331	3^2x7x37	2772	2^2x3^2x7x11	3224	$2^3x13x31$	3718	$2x11x13^2$	4234	$2x29x73$
1598	$2x17x47$	1960	2^3x5x7^2	2332	$2^2x11x53$	2773	$47x59$	3225	$3x5^2x43$	3720	$2^3x3x5x31$	4235	$5x7x11^2$
1599	$3x13x41$	1961	$37x53$	2336	2^5x73	2774	$2x19x73$	3233	$53x61$	3721	61^3	4255	$5x23x37$
1600	2^6x5^2	1971	3^3x73	2337	$3x19x41$	2775	$3x5^2x37$	3234	$2x3x7^2x11$	3723	$3x17x73$	4256	2^5x7x19
1624	2^3x7x29	1972	$2^2x17x29$	2345	$5x7x67$	2783	11^2x23	3239	$41x79$	3724	2^2x7^2x19	4257	$3^2x11x43$
1625	5^3x13	1974	$2x3x7x47$	2346	$2x3x17x23$	2784	2^3x3x29	3240	2^3x3^4x5	3740	$2^3x5x11x17$	4263	$3x7^2x29$
1632	2^5x3x17	1975	5^2x79	2349	3^4x29	2805	$3x5x11x17$	3248	2^4x7x29	3741	$3x29x43$	4264	$2^3x13x41$
1633	$23x71$	1976	$2^3x13x19$	2350	$2x5^2x47$	2806	$2x23x61$	3249	3^2x19^2	3750	$2x3x5^4$	4277	$7x13x47$
1634	$2x19x43$	1988	2^2x7x71	2365	$5x11x43$	2808	2^3x3^3x13	3250	$2x5^3x13$	3751	11^2x31	4278	$2x3x23x31$
1649	$17x97$	1989	$3^3x13x17$	2366	$2x7x13^2$	2809	53^2	3255	$3x5x7x31$	3752	2^3x7x67	4292	$2^2x29x37$
1650	$2x3x5^2x11$	2000	2^4x5^3	2375	5^3x19	2812	$2^2x19x37$	3256	$2^3x11x37$	3762	$2x3^2x11x19$	4293	3^4x53
1652	2^2x7x59	2001	$3x23x29$	2376	2^3x3^3x11	2813	$29x97$	3266	$2x23x71$	3763	$53x71$	4300	2^2x5^2x43
1653	$3x19x29$	2002	$2x7x11x13$	2378	$2x29x41$	2814	$2x3x7x67$	3267	3^3x11^2	3772	$2^2x23x41$	4301	$11x17x23$
1659	$3x7x79$	2009	7^2x41	2379	$3x13x61$	2820	$2^2x3x5x47$	3268	$2^2x19x43$	3773	7^3x11	4331	$61x71$
1660	2^2x5x83	2010	$2x3x5x67$	2380	$2^2x5x7x17$	2821	$7x13x31$	3285	3^2x5x73	3774	$2x3x17x37$	4332	2^2x3x19^2
1664	2^7x13	2013	$3x11x61$	2400	2^5x3x5^2	2822	$2x17x83$	3286	$2x31x53$	3782	$2x31x61$	4345	$5x11x79$
1665	3^2x5x37	2014	$2x19x53$	2401	7^4	2847	$3x13x73$	3289	$11x13x23$	3783	$3x13x97$	4346	$2x41x53$
1666	$2x7^2x17$	2015	$5x13x31$	2407	$29x83$	2848	2^5x89	3290	$2x5x7x47$	3784	$2^3x11x43$	4347	3^3x7x23
1674	$2x3^2x31$	2016	2^5x3^2x7	2408	2^3x7x43	2849	$7x11x37$	3293	$37x89$	3795	$3x5x11x23$	4355	$5x13x67$
1675	5^2x67	2023	$7x17^2$	2409	$3x11x73$	2850	$2x3x5^2x19$	3294	$2x3^3x61$	3796	$2^2x13x73$	4356	$2^2x3^2x11^2$
1679	$23x73$	2024	$2^3x11x23$	2414	$2x17x71$	2870	$2x5x7x41$	3311	$7x11x43$	3807	3^4x47	4365	3^2x5x97
1680	$2^4x3x5x7$	2025	3^4x5^2	2415	$3x5x7x23$	2871	$3^2x11x29$	3312	2^4x3^2x23	3808	2^6x7x17	4366	$2x37x59$
1681	41^2	2046	$2x3x11x31$	2418	$2x3x13x31$	2880	2^6x3^2x5	3320	2^3x5x83	3818	$2x23x83$	4370	$2x5x19x23$
1682	$2x29^2$	2047	$23x89$	2419	$41x59$	2881	$43x67$	3321	3^4x41	3819	$3x19x67$	4371	$3x31x47$
1683	$3^2x11x17$	2048	2^{11}	2420	2^2x5x11^2	2890	$2x5x17^2$	3354	$2x3x13x43$	3827	$43x89$	4374	$2x3^7$
1690	$2x5x13^2$	2057	11^2x17	2430	$2x3^5x5$	2891	7^2x59	3355	$5x11x61$	3828	$2^2x3x11x29$	4375	5^4x7
1691	$19x89$	2058	$2x3x7^3$	2431	$11x13x17$	2904	2^3x3x11^2	3362	$2x41^2$	3834	$2x3^3x71$	4399	$53x83$
1692	2^2x3^2x47	2059	$29x71$	2432	2^7x19	2905	$5x7x83$	3363	$3x19x59$	3835	$5x13x59$	4400	2^4x5^2x11
1700	2^2x5^2x17	2064	2^4x3x43	2448	2^4x3^2x17	2910	$2x3x5x97$	3364	2^2x29^2	3843	3^2x7x61	4402	$2x31x71$
1701	3^5x7	2065	$5x7x59$	2449	$31x79$	2911	$41x71$	3366	$2x3^2x11x17$	3844	2^2x31^2	4403	$7x17x37$
1702	$2x23x37$	2067	$3x13x53$	2450	$2x5^2x7^2$	2912	2^5x7x13	3367	$7x13x37$	3869	$53x73$	4424	2^3x7x79
1704	2^3x3x71	2068	$2^2x11x47$	2451	$3x19x43$	2914	$2x31x47$	3380	2^2x5x13^2	3870	$2x3^2x5x43$	4425	$3x5^2x59$
1705	$5x11x31$	2074	$2x17x61$	2464	2^3x7x11	2915	$5x11x53$	3381	$3x7^2x23$	3871	7^2x79	4452	$2^2x3x7x53$
1710	$2x3^2x5x19$	2075	5^2x83	2465	$5x17x29$	2916	2^2x3^6	3382	$2x19x89$	3872	2^5x11^2	4453	$61x73$
1711	$29x59$	2079	3^3x7x11	2478	$2x3x7x59$	2923	$37x79$	3392	2^6x53	3875	5^3x31	4464	2^4x3^2x31
1715	$5x7^3$	2080	2^5x5x13	2479	$37x67$	2924	$2^2x17x43$	3393	$3^2x13x29$	3876	$2^2x3x17x19$	4465	$5x19x47$
1716	$2^2x3x11x13$	2090	$2x5x11x19$	2480	2^4x5x31	2925	3^2x5^2x13	3402	$2x3^5x7$	3885	$3x5x7x37$	4466	$2x7x11x29$
1728	2^6x3^3	2091	$3x17x41$	2484	2^2x3^3x23	2926	$2x7x11x19$	3403	$41x83$	3886	$2x29x67$	4472	$2^3x13x43$
1729	$7x13x19$	2106	$2x3^4x13$	2485	$5x7x71$	2944	2^7x23	3404	$2^2x23x37$	3887	13^2x23	4473	3^2x7x71
1738	$2x11x79$	2107	7^2x43	2490	$2x3x5x83$	2945	$5x19x31$	3416	2^3x7x61	3888	2^4x3^5	4484	$2^2x19x59$
1739	$37x47$	2108	$2^2x17x31$	2491	$47x53$	2960	2^4x5x37	3417	$3x17x67$	3894	$2x3x11x59$	4485	$3x5x13x23$
1740	$2^3x3x5x29$	2109	$3x19x37$	2492	2^2x7x89	2961	3^3x7x47	3430	$2x5x7^3$	3895	$5x19x41$	4488	$2^3x3x11x17$
1742	$2x13x67$	2115	3^2x5x47	2499	$3x7^2x17$	2967	$3x23x43$	3431	$47x73$	3904	2^6x61	4498	67^2
1743	$3x7x83$	2116	2^2x23^2	2500	2^2x5^4	2968	2^3x7x53	3432	$2^3x3x11x13$	3905	$5x11x71$	4514	$2x37x61$
1748	$2^2x19x23$	2117	$29x73$	2501	$41x61$	2975	5^2x7x17	3440	2^4x5x43	3906	$2x3^2x7x31$	4515	$3x5x7x43$
1749	$3x11x53$	2124	2^2x3^2x59	2522	$2x13x97$	2976	2^5x3x31	3441	$3x31x37$	3915	3^3x5x29	4543	$7x11x59$
1750	$2x5^3x7$	2125	5^3x17	2523	$3x29^2$	2980	2^2x3^2x83	3444	$2^3x3x7x41$	3916	$2^3x11x89$	4544	2^6x71
1763	$41x43$	2132	$2^2x13x41$	2527	$7x19^2$	2989	7^2x61	3445	$5x13x53$	3952	$2^4x13x19$	4550	$2x5^2x7x13$
1764	$2^2x3^2x7^2$	2133	3^3x79	2528	2^6x79	2990	$2x5x13x23$	3450	$2x3x5^2x23$	3953	$59x67$	4551	$3x37x41$
1767	$3x19x31$	2134	$2x11x97$	2537	$43x59$	2992	$2^4x11x17$	3451	$7x17x29$	3968	2^7x31	4556	$2^2x17x67$
1768	$2^3x13x17$	2135	$5x7x61$	2538	$2x3^3x47$	2993	$41x73$	3471	$3x13x89$	3969	3^4x7^2	4557	$3x7^2x31$
1769	$29x61$	2136	2^3x3^2x89	2541	$3x7x11^2$	3002	$2x19x79$	3472	2^4x7x31	3975	$3x5^2x53$	4558	$2x43x53$
1770	$2x3x5x59$	2144	2^5x67	2542	$2x31x41$	3003	$3x7x11x13$	3476	$2^2x11x79$	3976	2^3x7x71	4559	$47x97$
1771	$7x11x23$	2145	$3x5x11x13$	2555	$5x7x73$	3007	$31x97$	3477	$3x19x61$	3977	$41x97$	4560	$2^4x3x5x19$
1775	5^2x71	2146	$2x29x37$	2556	2^2x3^2x71	3008	2^6x47	3478	$2x37x47$	3978	$2x3^2x13x17$	5475	$3x5^2x61$
1776	2^4x3x37	2175	$3x5^2x29$	2573	$31x83$	3009	$3x17x59$	3479	7^2x71	3995	$5x17x47$	4576	$2^5x11x13$
1785	$3x5x7x17$	2176	2^7x17	2574	$2x3^2x11x13$	3010	$2x5x7x43$	3480	$2^3x3x5x29$	3996	2^2x3^3x37	4598	$2x11^2x19$

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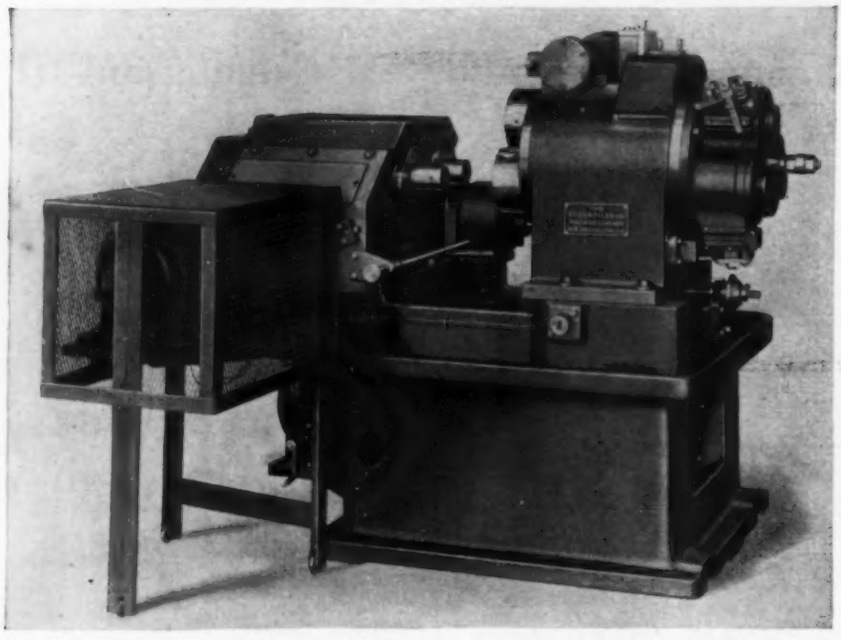


Rear view of Goss & DeLeeuw Two-Spindle Automatic Chucking Machine, showing the driving means inclosed by a quickly removable wire screen guard mounted on wheels

Goss & DeLeeuw Two-Spindle Chucking Machine

Comparatively simple chucking jobs are handled in the two-spindle automatic chucking machine announced by the Goss & DeLeeuw Machine Company, New Britain, Conn. This machine, an addition to the line of four-spindle chucking machines manufactured by the concern, will perform in combination such operations as boring, facing, turning, drilling, reaming, and threading. The machine is primarily intended for jobs requiring both plain machining and threading, but is also adapted to two combination operations of plain machining. It is readily arranged to cut two threads of different pitches and diameters simultaneously in the same spindle.

Two horizontal spindles revolve the cutting tools. Opposite these spindles is a faceplate carrying three work-holding chucks, two of them presenting the work to the tools, and the third, in the upper position, for unloading and loading. Indexing the faceplate carries the work successively from the loading position to the first spindle at the rear, and then to the second spindle in front, and finally back to the loading position. Thus, two machining operations are being performed simultaneously. The finished piece can be ejected automatically from the air chuck between the second position and the loading position, and the operator has only to place the rough piece in the open chuck and trip the closing valve. All three mechanisms for indexing, feeding, and withdrawing the tools, together with starting, reversing, and stopping of the threading spindle, are automatic in operation and mechanically interlocked, so that they cannot operate except in the proper sequence.

The range of the machine for handling different types and sizes of work is 7 in. between the chuck centers, together with a wide clearance while indexing, which permits the handling of large and irregular shaped pieces. Production ranges from 180 to 1,200 pieces per hour with the standards sets of feed pick-off gears. Spindle speeds range from 100 to 1,000 r.p.m. for either threading or plain machining. These spindles are ball bearing mounted, and the threading spindle is driven and reversed by the standard Goss & DeLeeuw independent reversing motor unit. This drive can handle small tapping jobs at the rate of 20 pieces per min., and yet has sufficient power to pull a 1¼-in. taper pipe tap in brass or iron.

The time required to change over from one set-up to another averages about one-half hour. The feed cycle and individual spindle speeds are adjusted by quick change pick-off gears. The cam is seldom changed, and the operation requires only about ten minutes. The depth of cut is controlled by means of a micrometer screw reading to thousandths, and thread cutting is adjustable to a fraction of a turn.

All threading tools are controlled by positive leadscrews in constant engagement with their lead nuts. Each spindle is carried in its individual slide, and the feed for the rear, or plain machining spindle, is furnished by a hardened steel solid track cam. The feed is transmitted to the slide which carries the spindle, and the spindle does not, therefore, feed out of its bearings.

Three air chucks are furnished as standard equipment and are built after the G & L design with round jaws and bore. The chuck jaws are operated by a wedge attached to the end of a draw bar that extends back to the air cylinder at the rear of the turret. A double piston of two diameters with the line air pressure constantly maintained between the two pistons does away with stuffing boxes. The valve admits and exhausts air at the large end to produce the reciprocating motion. The valve handle is tripped automatically to open the chuck as it approaches the loading position, and is convenient to the operator for chucking. A chucking pressure of 2,100 lb. is obtained at the jaws with air at 60 lb. per sq.in. Maximum opening of the jaws is larger than usual, but hand-operated 2-jaw chucks are furnished for work pieces requiring a still larger opening. Power for indexing is furnished by

the special double air cylinder on the top of the turret. It operates on a principle similar to that used for the air chucks. An unexpected cutting off of the air supply will not cause tool breakage because of failure to index, nor will it result in the loosening of the work in the chucks.

The combination chip pan and coolant reservoir is cast integral with the bed. Chips are removed through the hole in the bed at the turret end. Finished pieces can also be guided out through this hole on a wire chute. The lubricant pump is mounted on the boss at the rear of the machine. Practically all of the bronze bearings are oiled by means of the mechanical lubricator shown under the headstock.

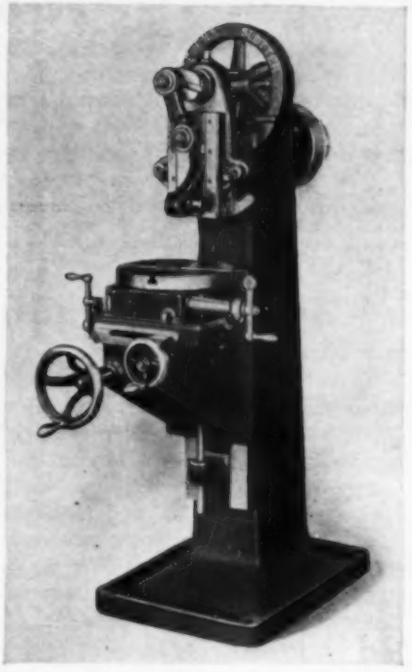
Gilmer "Speedage" Fabric Belt

Endless woven fabric belts have been placed on the market by the L. H. Gilmer Company, Tacony, Philadelphia, Pa., under the trade name of "Speedage." They are especially designed for high-speed, small pulley work and are furnished in light, medium, and heavy weights in different numbers of ply. They can be used on pumps, compressors, grinders, drill presses, routers, carvers, and polishing or buffing machinery. There is no high point in the belt to produce vibration when operating at high speed. Slip can be further reduced by applying "Gilmerite."

"Speedage" belts in the light and medium styles are made in widths from $\frac{3}{16}$ to 10 in., and in the heavy style in widths from $\frac{1}{2}$ to 10 in.

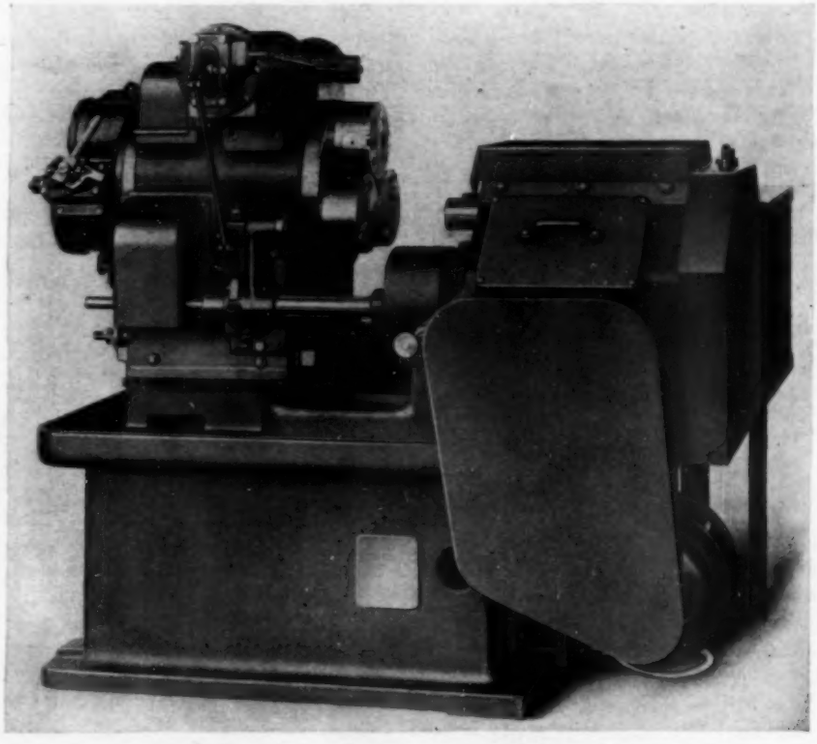
Stevens Vertical Slotter

A vertical slotter with the accuracy required for toolroom use, and the strength required for manufacturing, has been announced by John B. Stevens, Inc., 304 Hudson St., New York, N. Y. This machine is adapted to die work, key seating, both straight and taper, internal and external gear patterns where draught is required, and all vertical slotting within its range. The longitudinal and cross motions of the rotary table provide for any outline. The rotary-table worm shaft is arranged with dial graduated to read in minutes. For small divisions and rapid work, the table can be revolved by hand, using the lockpin that provides twelve accurate divisions, including dividing for squares, hexagons, and octagons. Micrometer dials are used on the screws for longitudinal, cross, and knee movements. A choice of two positions for binding cutting tools is provided. The stroke is adjustable from 0 to 4 in., and the tool shank diameter is $1\frac{5}{8}$ in.



Three different ram speeds are obtainable. The ram slide can be swiveled from 0 to 5 deg., either to the right or left of the central position, and set to an index reading in degrees. A motor drive can be arranged.

Specifications: Diameter of circular table, 12 in.; vertical adjustment of table, $11\frac{1}{2}$ in.; adjustment in line with spindle, $5\frac{1}{2}$ in.; adjustment across line of spindle, 7 in.; largest diameter of cone, 10 in.; stroke of slide, 4 in.; column face to tool center, $9\frac{1}{4}$ in.; floor space required, 28x44 in., and weight, 1,150 lb.



Front view of the Goss & DeLeeuw Two-Spindle Automatic Chucking Machine affording production of 180 to 1,200 pieces per hour

Ductone Fluxed Electrodes

A stable, smooth arc is obtained with "Ductone" fluxed electrodes announced by the Fusion Welding Corporation, 10257 Torrence Ave., Chicago, Ill. It is said that Ductone fluxing permits carrying the rate of fusion as high as it is possible for an operator to handle with the metallic arc. The surface slag remaining on a weld is rather heavy, but it is quite brittle and strictly nonadherent when cold and can be brushed off readily. A long arc is

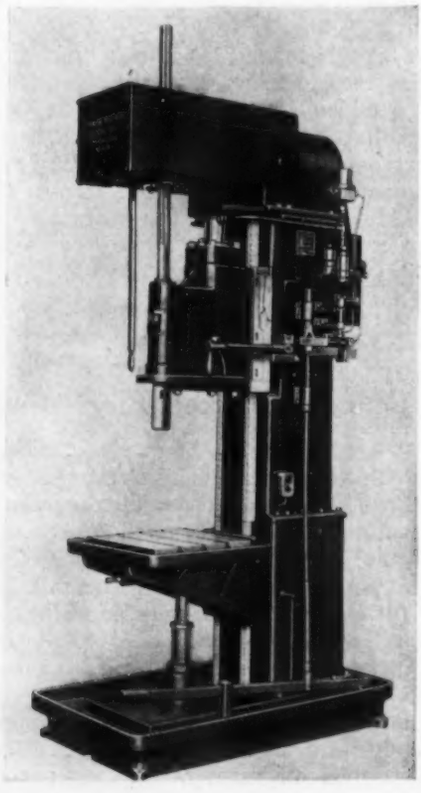
employed and the arc voltage may be doubled over that employed with a bare steel electrode. Tests indicate that the electrode will produce welds in mild steel possessing tensile strength of over 75,000 lb. per sq.in., and elongation of over 40 per cent.

Ductone fluxing will be applied as a coating to various carbon and alloy steel rods and possibly to non-ferrous metals. The rods are decorated with metallic colors to indicate types.

"Master" Hydraulic Drilling Machines

Three sizes of heavy-duty production drilling machines — 20, 25, and 30 in.—have been placed on the market by The Superior Machine Tool Company, Kokomo, Ind. The spindle is driven through the usual arrangement of change gears from an electric motor. The shaft running from the motor to the gears carries a sprocket from which a chain drive passes to the Oilgear pump. The head carries a cylinder and piston, the piston rod extending upward and being secured to the frame. This rod is drilled with two channels leading to either side of the piston. By tripping valves, oil under pressure is admitted to either side of the piston to provide downward or upward movement of the drill.

Provision is made for regulating the movement of the drill head, so that various cycles may be secured. The machine may be either full automatic or semi-automatic in operation. When semi-automatic, the start of the cycle requires the feed to be retripped by hand. Where the work is of the nature permitting full-automatic operation, the tripping of the feed may be automatic. Provision is made at the side of the machine, back of the drill head, for the mounting of cams for controlling successive steps in a cycle. These cams engage a roller secured to a suitable link mechanism for controlling the flow of oil to the hydraulic cylinder. A treadle connected to this mechanism constitutes a safety device, which the operator may use to disengage the hydraulic feed whenever required. With the treadle pushed down, the operator pulls back a pistol grip, withdrawing the roller from engagement with the cams, thereby disengaging the hydraulic feed until the roller is released.



Power is transmitted from a built-in motor to a horizontal shaft extending to the front of the machine, through pick-off gears to a second horizontal shaft, which carries a twin-disk clutch for forward and reverse motion. The clutch shaft carries a spiral bevel pinion, which in turn drives a spiral bevel gear splined to the spindle. The drive mechanism is furnished throughout with helical gears, and all drive shafts are mounted on Timken roller bearings.

Heavy-ribbed standard T-slot tables are furnished as regular equipment, being raised or lowered by means of a telescoping screw and sleeve. The gusher-type pump has a capacity of 12 gal., driven by an individual motor mounted in the column, which is furnished as extra equipment.

These "Master" drilling machines can be furnished also in geared-feed types, and in both single-spindle and gang types for both hydraulic and geared feeds.

Specifications of "Master" Drilling Machines

Size, in.	20	25	30
Drill capacity in solid steel, in.	1¼	2	2½
Center of spindle to face of column, in.	10⅜	12⅜	15⅜
Maximum distance spindle to table, in.	30	32	34
Minimum distance spindle to table, in.	4	4	4
Maximum distance spindle to base, in.	45	47	49
Minimum distance spindle to base, in.	33	33	33
Hydraulic feeds, in. per min.	0 to 15	0 to 15	0 to 15
Geared feeds, in.	0.005 to 0.105	0.005 to 0.105	0.005 to 0.105
Length of feed, in.	12	14	16
Range of speeds, r.p.m.	68–842	68–842	68–842
Motor required, hp	5	7½	10
Net weight, lb.	2,500	3,600	4,700

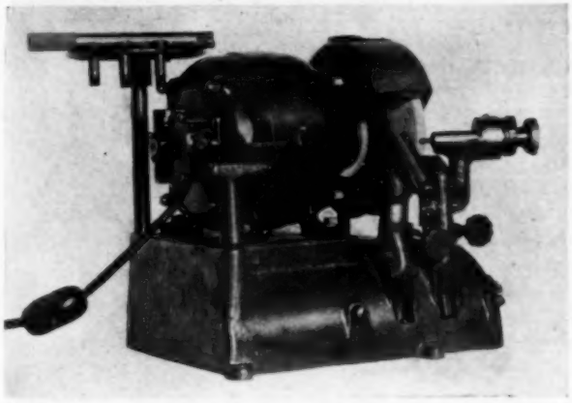
Barber-Colman Indicator Finger

For getting into places that cannot be reached by a regular indicator, the Barber-Colman Company, Rockford, Ill., is announcing an indicator finger to be clamped to a dial indicator. It is fastened to the case barrel surrounding the indicator plunger so that the curved end of the bell crank rests against the end of the plunger. Thus, movement of the ball end of the bell crank is transferred to the indicator. The finger can be put on and taken off easily and quickly.

The frame of the finger is a steel forging, and the bell crank is a tool steel stamping. The bell crank has a stop lug so that it will not drop below a normal working position. The device is finished in a dull black and the ball point is polished.

Wells No. 1020 Tap and Drill Grinder

For sharpening both taps and drills from ¼ in. down to the smallest size, the Wells Manufacturing Company, P. O. Box 613, Greenfield, Mass., is announcing the No. 1020 tap and drill grinder. The tap or drill is mounted in a draw-in chuck held in a quill. The quill is slid into the lining-up holder at the left of the machine, after which the quill is inserted in the holder at the right and turned slowly to the right until the tool is sharpened. This fixture has a cam that produces the correct relief. The cam is changed readily.



To thin the web, the tap or drill is placed in the holder just left of the sharpening fixture, and the arm is rocked against the thin wheel. This gives the proper hook to a tap as well as more chip room, and gives a drill a thin point.

The equipment consists of one diamond, two emery wheels, six draw-in chucks for taps, six collets for drills, one ¼-hp. motor with cord, plug, and switch, and three cams for taps—2, 3 and 4 flutes. The machine is regularly furnished for ¼-in. taps and drills down, but can be furnished for ½-in. tools.

Gisholt Improved Universal Tool Grinder

Several improvements to adapt its universal tool grinder to sharpening tungsten-carbide tools have been made by the Gisholt Machine Company, 1201 East Washington Ave., Madison, Wis. These improvements do not sacrifice the efficiency of the machine on high-speed or super-high-speed steels.

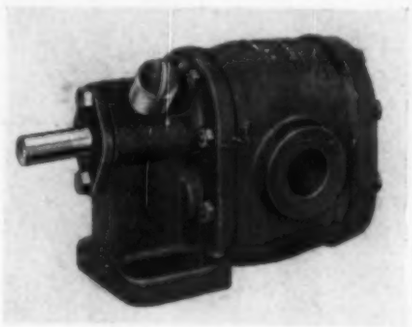
Since the nature of tungsten-carbide tools necessitates a light, even pressure against the grinding wheel, the spindle has been redesigned to incorporate a spring-cushion, ball thrust bearing. Excessive pressure against the face of the cup wheel cannot be exerted. If tools other than tungsten carbide are being ground, this cushioning device may be locked so that heavy cuts may be taken.

The design of the wheel mount is such that the removal and replacement of different types of wheels for different materials may be accomplished very rapidly. The construction at the wheel end of the spindle is of the labyrinth type to protect the bearings from tungsten-carbide dust. Oil gages have been added to both front and rear bearings. The improved wheel guard is of heavier construction and may be direct connected to overhead dust collection systems. Otherwise, the machine is the same as the original design. It is intended primarily for grinding single-point cutting tools for turret lathes, engine lathes, shapers, planers, slotters, and boring mills, the tools being of the inserted cutter or solid forged type and tipped with tungsten carbide or made of high-speed steel.

A spring cushion on the spindle eliminates excessive pressure of tungsten-carbide tools against the wheel

Brown & Sharpe No. 55 Rotary Geared Pump

Ball bearings and spiral gears are employed in the No. 55 rotary geared pump announced by the Brown & Sharpe Manufacturing Company, Providence, R. I. This pump replaces the No. 5 previously manufactured. Improvements in the design and construction of this pump make it particularly applicable for supplying oil under pressure for hydraulic operation of machines. The cap, stand, and housing are reinforced. Two more bolts have been added. This increases the clamping effect by 30 per cent and permits the use of high pressures without danger of blowing the gaskets. The suction port, including the pipe tap, has been made larger to permit free entrance of oil. Changes in the discharge port tend to minimize the load on the bearings, and thus cause them to wear longer.

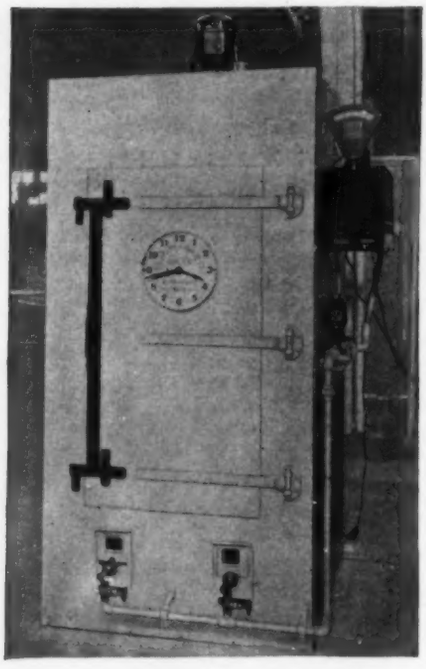


The No. 55 pump at 1,200 r.p.m. delivers approximately 36 gal. per min. at 100-lb. pressure. The pump is also suitable for Diesel-engine lubrication.

Despatch Type H Gas-Recirculating, Air-Drawing Oven

Low-temperature heat-treating and air-drawing requirements up to 1,600 deg. F. can be taken care of with the type H gas-recirculating, air-drawing oven announced by the Despatch Oven Company, 622 Ninth St., S.E., Minneapolis, Minn. The inside working space of the oven is 2 ft. wide, 3 ft. deep, and 4 ft. high, but can be changed to meet requirements. The oven is of the double-wall type reinforced with structural

steel members, the walls being of heavy steel. Between the walls are 5 in. of insulation, and there is a third wall or lining which forms the interior working chamber. At the top of the oven is a vertical motor and fan arrangement and in the bottom there is a gas heating system. Between the third wall and the second wall is an air space. The purpose of the third wall is to form a baffle so



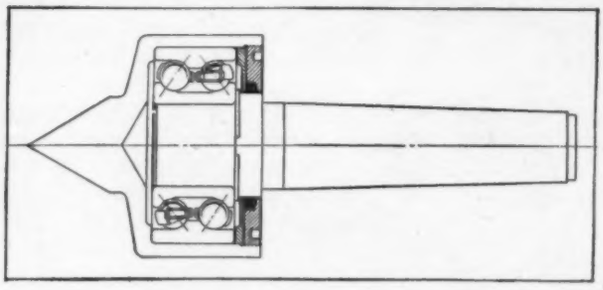
Recirculation of air in the working chamber of the Despatch Type H Gas-Recirculating, Air-Drawing Oven effects economies since the air temperature need be raised only from 5 to 10 deg. F.

that the heated air, which is generated in the heating chamber, may rise to the top of the oven without entering the working chamber. This flow of air is accelerated by the fan. The fan takes the heated air and forces it down upon the parts in the oven.

In the third wall, near the bottom, is a slotted arrangement on each side. The air in the working chamber passes out of these slots and becomes mixed with the heated air rising from the gas burners. In this way, the temperature of the air within the working chamber is again raised to the proper degree. Recirculation of the air saves fuel, inasmuch as the recirculated air need only be raised 5 to 10 deg. Uniformity of temperature in the working chamber is kept within plus or minus 5 deg. F. For further assurance of uniformity, a vapor-tension, thermostatic control system is furnished. This control may be quickly adjusted for the proper operating temperature. The thermostat operates in conjunction with a relay and motor-driven valve in the gas supply line. Removal of air from the oven to offset that being provided through combustion is taken care of by a natural draft stack.

"Ready" Improved Ball-Bearing Lathe Center

An improved and more efficient bearing closure is employed on the ball-bearing lathe center announced by The Ready Tool Company, Bridgeport, Conn. This closure is made in two parts, an inner piece, or washer, which contacts directly with the face of the New Departure pre-

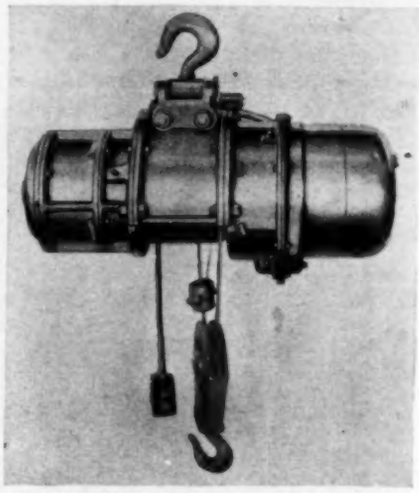


loaded, double-row ball bearing, and an outer piece, or locknut, carrying the felt ring. By this arrangement, the thread is cut on the relatively thick outer piece and a stronger, more secure clamping effect is obtained.

Since permanence of bearing rigidity and accuracy depends upon the exclusion of abrasive dirt from the balls and races, an efficient closure is not only important, but its removal by users is not desirable. For this reason, the set screw locking the clamp nut is covered with a flush soft metal seal.

Wright Type W Electric Hoist

For installations where high operating speeds, economical operation, and low-cost maintenance are essentials, the Wright Manufacturing Company, Bridgeport, Conn., is introducing a Type W electric hoist, available in models from ¼ to 10 tons. The motors employed are designed especially for this service. Alloy steel shafts, drop-forged, heat treated gears and pinions, and "Tru-Lay"

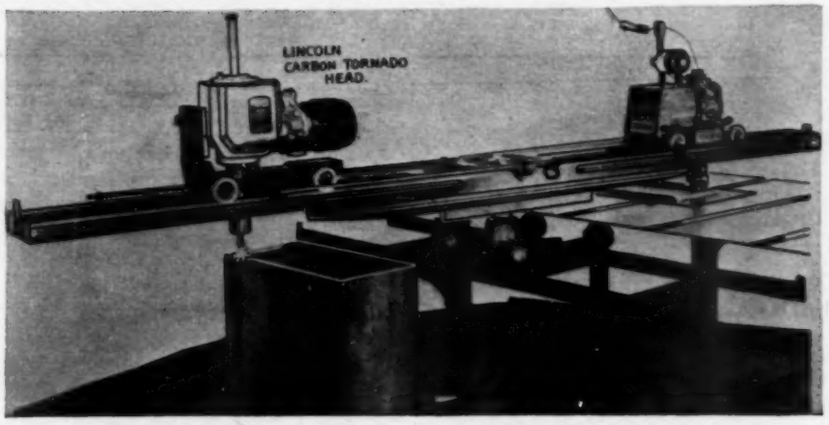


Wright Type W Electric Hoist for indoor and outdoor use

preformed cable are employed. The hoists are designed for different types of suspensions and are furnished with either push-button or pendant rope control at the same price. The motors and controls are fully inclosed, being dust-proof and weather-proof, so that the hoists are suited for both indoor and outdoor installations.

"Geweco" Universal Shape-Welding Machine with Arc-Welding Head

A series of shape-welding machines to guide electric arc-welding heads automatically over any regular or irregular line has been announced by the General Welding & Equipment Company, 70 Lansdowne St., Boston, Mass. The machine illustrated employs a Lincoln "Tornado" head for welding heads in tanks. These tanks have formerly been welded with straight-line machines, which has meant four different settings for the four sides. The time required formerly was 9 min., of which 6 min. were used for resettings. The shape-welding machine does this with one



"Geweco" Universal Shape-Welding Machine with an arc welding head for welding heads in tanks without resetting

single setting, which saves considerable time. The speed of welding $\frac{1}{16}$-in. stock, or $\frac{1}{8}$ in. at the top edge, is 25 linear inches per minute.

Ohmer-Kienzle "Vibracorder" Machine-Time Recorder

For recording the time that any piece of machinery is in operation or is idle, the Ohmer Fare Register Company, Dayton, Ohio, is announcing the Ohmer-Kienzle 7-day "Vibracorder." A 5-in. paper disk, taken from the instrument once a week, tells the story of seven days' operation. The device is operated by vibrations or oscillations which are always present in the machine while running.

Ohmer-Kienzle 7-Day "Vibracorder" for recording running time and idle time of machinery

The "Vibracorder" resembles a small clock, and employs an eight-day, 6-jewel clock. In addition to moving the hands of the clock, the mechanism rotates a drum within the instrument bearing a specially prepared disk or chart under the point of a steel stylus or pen point. The chart is laid out with spaces for minutes, hours and days, and for both day and night operation. A wide line is plotted on the chart by the stylus as it moves under the influence of machine vibrations. A light line is drawn by the stylus when the machine is at rest. The difference in the lines is very pronounced, facilitating a quick check-up.

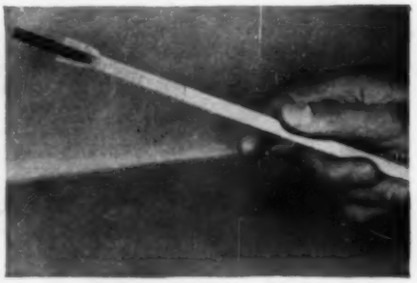
Hisey-Wolf 10 and 15 Hp. "Texdrive" Buffing and Polishing Machines

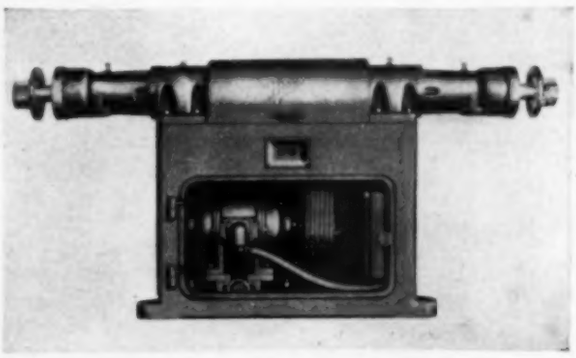
Unit spindle-head construction is employed in the 10 and 15 hp. "Texdrive" buffing and polishing machines announced by The Hisey-Wolf Machine Company, Cincinnati, Ohio. The motor is ball-bearing equipped and is mounted horizontally on a dovetailed sliding base, adjusted by means of a handwheel and feed screw. By this means, proper belt tension is secured, together with accurate alignment. The spindle head is mounted on four ball bearings, but Timken roller bearings are optional.

A large door is provided in the column for easy access to the motor and starter. Bearing boxes are keyed to the column. Wheel arbor ends are finished with flat-top threads, affording security in holding the buffing wheels. The length of the spindle over-all is 82 in.; length of spindle projections each end, 15 in., and net weight, 2,600 lb.

General Electric Type R Heavily Coated Electrode

A 0.13 to 0.18 carbon steel electrode covered with a heavy cotton braid impregnated with an arc stabilizing flux has been placed on the market by the General Electric Company, Schenectady, N. Y. This electrode, designated as Type R, is available in diameters from $\frac{1}{8}$ to $\frac{3}{8}$ in., and in 18 in. lengths. Metal deposits of this electrode have high tensile strength and will produce a homogeneous structure, resulting in a ductile weld. This is caused by the fact that, during the arc transference period, the metal is in a protective atmosphere, because the electrode itself burns away quicker than the coating and thus is not exposed to the atmosphere. Arc stability and high arc voltages obtained with this electrode permit high welding speed.



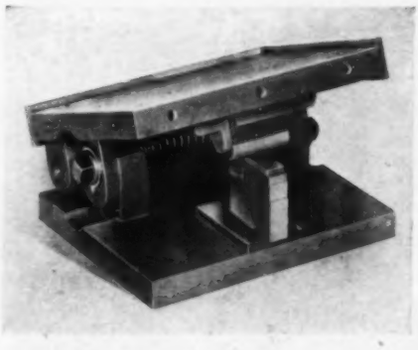


"American Oxycop" Flame Cutting Machine

Ordinary city gas is used without a booster on the "American Oxycop" flame cutting machine announced by the Bradley Machinery Company, 430-32 East Woodridge St., Detroit, Mich. This machine is especially suitable for toolroom use, and saves much time in roughing out press tool dies in steel and most alloy steels. The die as it comes from the machine requires a minimum of finishing. The shape to be cut is reproduced from a drawing placed on the table, but where production runs are expected on parts, a templet tracer can be had, together with guide strips. The cutting torch follows the movement of the tracer and cuts out the shape in the plate resting on parallels on the open base of the machine. The speed of cutting is 1 ft. per min., and in the model illustrated the cutting area is 18x18 in. Larger machines can be built and accessories can be provided.

Krag Sine Angle Plate

Combination of two accurate methods of measuring an angle, namely the sine and the gage block, are employed in the Krag Sine Angle Plate developed by Franz K. Krag, 319 N. Albany Ave., Chicago, Ill. The device consists of two elements hinged together and arranged so that the one may be clamped at desired angle between 0 and 45 deg. with respect to the other. The bottom element is provided with a ground, hardened and lapped anvil, and the upper element with a ground, hardened and lapped cylindrical surface. These two elements constitute the working surfaces between which the precision blocks are placed, the space between them comprising the sine of the angle. The distance between the center of the shaft and the center of the cylindrical face is exactly 3 inches.

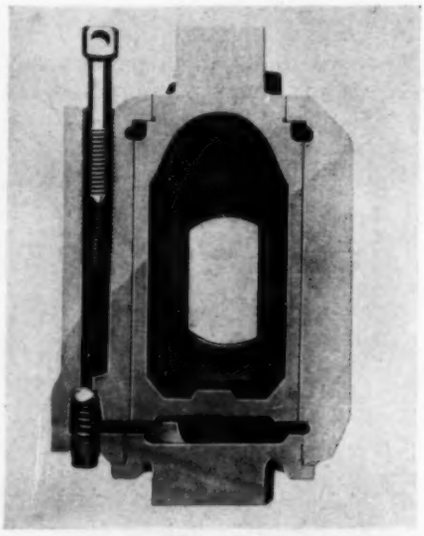


No surface plate or height gage is required for setting up. To obtain any given angle, the two clamping screws holding the two plates in position are loosened by the socket head wrench. Precision blocks corresponding to the sine of the required angle are placed between the anvil and cylinder, and the movable element is locked securely into position.

The blocks are available in two models, namely model "S" of hardened steel throughout, and the Model "C" of cast iron. The upper plate is drilled with a number of ¼-in. holes for clamping purposes. All four sides of the upper plate are drilled horizontally to carry ground guide gages or gage plates, which are removable and adjustable. The blocks measure $4\frac{3}{16}$ x 4 in. and are ½ in. thick.

"A.C.F." Milliken Valves

The few parts in "A.C.F." Milliken valves, placed on the market by the American Car & Foundry Company, Valve Division, 30 Church St., New York, N. Y., permit low first cost and low maintenance cost. The valve has a solid head, thereby avoiding the use of glands, gland bolts, bonnets or stuffing boxes, and employs no packing or gaskets. It has the same face-to-face dimensions as standard flanged gate valves and opens and closes with a quarter turn, having a positive stop. All moving parts are completely lubricated. The valve is offered for use on gasoline, oil, water, steam, boiler blow-off, air, vacuum, gas or chemical lines, and can be furnished in sizes from 1 to 8 in. and for pressures of 125, 175, and 250 lb. per sq.in., and also in the Venturi type for 500 lb. per sq.in., both in screwed and flanged models. It is also available in aluminum and acid-resisting bronze in sizes up to 3 in., and also in the form of special valves for handling to 66 deg. Bé. sulphuric acid, as well as in other metals to suit various purposes.



Cross-section of "A.C.F." Milliken Valve, showing that the plug is not raised away from the seat

In this type of valve there are no seats to cut, and hence it is not necessary to take a valve off the line for reseating. It also occupies less headroom than the standard gate valve. The plug is the only moving part and it is completely lubricated.

EQUIPMENT ADAPTATIONS

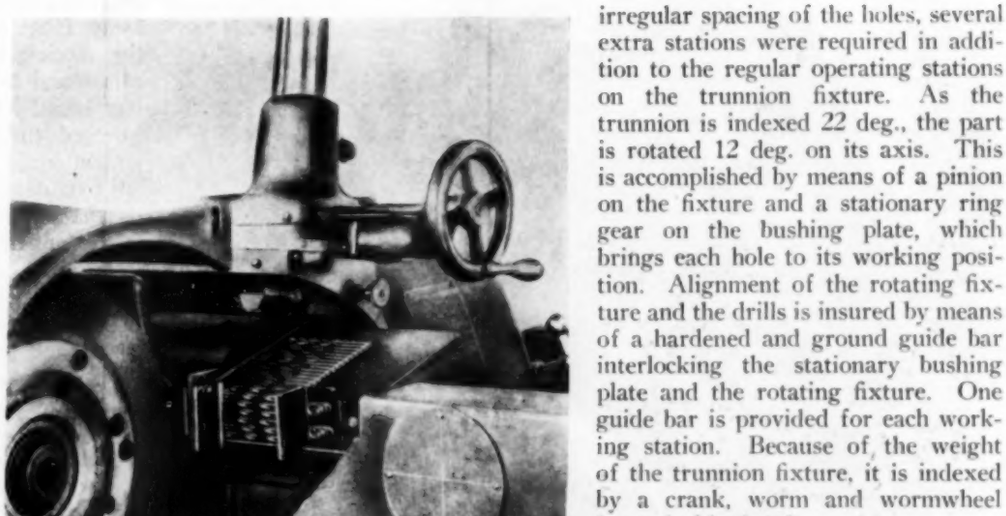
RECENTLY DEVELOPED BY THE MAKERS

Centerless Grinding of Straight-Shank Drills

By means of a special feeding arrangement, a Cincinnati No. 2 centerless grinder has been equipped for centerless grinding of straight-shank drills. These drills are placed on a turning shaft with the fluted barrel toward the grinding and regulating wheel thrust. They pass by gravity to the magazine arrangement and are loaded singly by a pusher action in a horizontal position. An end-elevating stop positions each drill for proper grinding. An in-feed cut is taken by employing an automatic in-feed attachment. Co-ordination of feeding and grinding operations is obtained by having the same power source for all mechanisms.

The grinding wheel has a profiled face so as to grind a back taper on the fluted barrel and grind the shaft straight. As the grinding cut is completed, the loading arrangement pushes the next drill automatically into the grinding position, while the drill which has been ground is pushed out of the back of the fixture. The elevating end stop is so timed that as the pusher introduces a new piece into the grinding position, the end stop elevates and allows the completed drill to be pushed out of the grinding position and into an ejecting chute at the rear. The end stop is then lowered into position.

Straight-shank twist drills can be ground in sizes ranging from $\frac{1}{16}$ in. in diameter by 3 in. long up to $\frac{5}{8}$ in. in diameter by 8 in. long. Wheels wide enough to grind the entire length of drills are used. Production on the centerless grinding of straight shank drills averages 15 drills per min., per cut, on the small diameters, and down to 6 drills per min. on the larger diameters. Stock removal totals between 0.005 in. and 0.010 in., and two cuts are usually taken to insure a good finish. Limits for roundness, straightness, and size are held within 0.0003 in. The machine was built by Cincinnati Grinders Incorporated, Cincinnati, Ohio.



Close-up of Cincinnati No. 2 Centerless Grinder supplied with a special feeding arrangement for centerless grinding of straight-shank drills

Ex-Cell-O Special Drum-Type Horizontal Drilling Machine

For drilling and counterboring several radial holes in a drop forged steel part, the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich., has designed the special machine illustrated. The uneven location of holes, as well as the range in size, added to the difficulty of designing a machine for handling all of these operations. The part to be drilled has 13 holes distributed unevenly around the periphery, and, in addition, the depth and size of these holes vary. By having more than one operation in several of the holes, it was impossible to use a radial type of machine.

The part to be drilled is located in the fixture by a three-point bearing and clamped by means of an equalizing toggle operated by means of a spanner wrench. Because of the irregular spacing of the holes, several extra stations were required in addition to the regular operating stations on the trunnion fixture. As the trunnion is indexed 22 deg., the part is rotated 12 deg. on its axis. This is accomplished by means of a pinion on the fixture and a stationary ring gear on the bushing plate, which brings each hole to its working position. Alignment of the rotating fixture and the drills is insured by means of a hardened and ground guide bar interlocking the stationary bushing plate and the rotating fixture. One guide bar is provided for each working station. Because of the weight of the trunnion fixture, it is indexed by a crank, worm and wormwheel instead of by hand.

During the different operations, 13

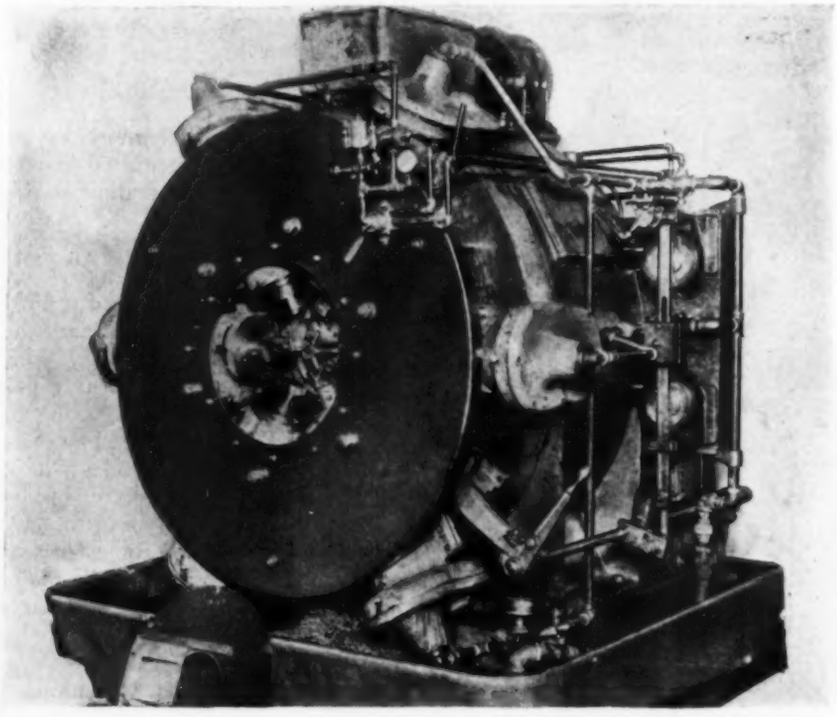
holes are drilled, varying in size from $\frac{3}{16}$ to $\frac{9}{16}$ in., while only five of these holes are counterbored. The heads are mounted vertically on the slides of a specially designed, two-way hydraulic feed machine. The motors driving the multiple head are mounted in the slides. A hand control for starting and stopping the feed is conveniently located, while an emergency foot stop is also furnished directly below the hand control lever.

Reed-Prentice Special Six-Spindle Turning Machine

For turning three-way differential spiders, the Reed-Prentice Corporation, Worcester, Mass., has designed the six-spindle multiple turning machine illustrated. However, the unit can be furnished for machining four-way spiders or work of similar construction. The feed and indexing mechanisms are hydraulically operated by means of a standard Oilgear pump independent of the main drive. The drive is through a 15-hp., 1,200 r.p.m. standard motor.

In operation, the piece is set into the special jaws of the Logan air chuck and clamped. Next, by means of the lever at the lower right-hand side the Oilgear feed mechanism is thrown into operation. An interlocking mechanism is furnished between the air chuck mechanism and the hydraulic feed mechanism, making it impossible to start the feed until the air chuck is closed. Three spindles rapid traverse, and the rough turning feed, is automatically thrown in. When the rough turning operation is completed, the rapid traverse again operates, withdrawing three of the spindles. The three finishing spindles rapid traverse to the work automatically, throwing in the turning feed, and withdrawing rapidly with rapid traverse. Between the roughing and finishing operations, the air chuck mechanism carrying the work is indexed automatically by the Oilgear mechanism, from the roughing to finishing operation. In other words, the machine is semi-automatic, it being necessary for the operator only to load and unload the work.

Cutting compound is piped to the end of each spindle and feeds down through to the turning tools and directly on the work. The weight of the machine is 8,150 lb., exclusive of the motor.



Pneumatic Fixture for Cutting-Off in Hand Milling Machine

Cutting-off bar stock in production quantities is done on the hand milling machine illustrated by means of a pneumatic fixture. This machine, built by the Kent-Owens Machine Company, 958 Wall St., Toledo, Ohio, is the standard No. 1 size. The stock is a special rolled-steel section which must be cut into short lengths for making door latch parts. The irregular contour of the work makes the cross-section of the cut vary widely. Hand feed is desirable on this type of work, since it is possible for the operator to keep the feed at a maximum.

To make the work easier to handle, an air-operated fixture is used. This fixture clamps automatically as the cutters are fed into the work and unclamps automatically as they move away from it. The operator feeds the stock with his right hand and raises and lowers the head with his left hand. The head is raised and lowered through a long lever arm and a sector and rack arrangement. Adjustable stops on the vertical bolt on the top of the machine limit the movement of the head. As the head is elevated, the air valve is tripped to release the clamping fixture. The operator then advances the stock to a stop and proceeds to feed the head downward into the work. Shortly before it reaches the work, the trips reverse the valve movement, causing the fixture to clamp the work solidly. Two cutters are employed, two pieces being cut off on each stroke. Production obtained is 900 pieces per hour.

PATENTS

MARCH 3, 1931

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Metal-Working Machinery

Method and Means for Turning and Finishing Pieces of Work. Olof Enoch Trobeck, Berlin, Germany, assigned to The National Acme Co. *Patent 1,794,390.*

Welding Machine. Grover A. Hughes and Robert H. Pool, Youngstown, Ohio, assigned to Truscon Steel Co. *Patent 1,794,406.*

Cam-Actuated Lathe. Edwin R. Smith and Richard A. Ashton, Seneca Falls, N. Y., assigned to Seneca Falls Machine Co. *Patent 1,794,423.*

Work Feeding and Removing Mechanism for Machine Tools. Edwin R. Smith and Albert Schinkez, Seneca Falls, N. Y., assigned to Seneca Falls Machine Co. *Patent 1,794,424.*

Multiple-Spindle Grinding Machine or the Like. William L. Bryant, Springfield, Vt. *Patent 1,794,440.*

Vertical Turret Lathe. Edward P. Bullard, Jr., Stratford, Conn., assigned to The Bullard Co. *Patent 1,794,441.*

Hydraulic Change-Speed-Gear Mechanism. Frank H. Mussler, Bridgeport, Conn., assigned to The Bullard Co. *Patent 1,794,472.*

Molding Machine. Walter E. Skidmore, East Liverpool, Ohio. *Patent 1,794,556.*

Apron Mechanism for Lathes. Alfred Trosch, Rochester, N. Y., assigned to Consolidated Machine Tool Corporation. *Patent 1,794,657.*

Contact-Welding Machine. Frederick W. Doyle, Chicago, Ill., assigned to Reserve Holding Co. *Patent 1,794,760.*

Electric-Welding Apparatus. Joseph W. Meadowcroft, Philadelphia, Pa., assigned to Edward G. Budd Manufacturing Co. *Patent 1,794,789.*

Screw Machine. X. Raymond Dodge, Hinsdale, Ill. *Patent 1,794,885.*

Hydraulic Speed Control for Lathes. William H. Foster, Elkhart, Ind., assigned to Foster Machine Co. *Patent 1,795,018.*

Assembling Press. Alva W. Phelps, Anderson, Ind., assigned to Delco-Remy Corporation. *Patent 1,795,141.*

Strip-Metal-Bending Machine. Daniel Smith, Wolverhampton, England. *Patent 1,795,151.*

Nail-Making Machine. Ralph F. Kiefer, Pittsburgh, Pa., assigned to Strowan Corporation. *Patents 1,795,216 and 1,795,217.*

Means for Holding Normally Reciprocating Spindles from Reciprocating. Conrad Ott, Waynesboro, Pa., assigned to Landis Tool Co. *Patent 1,795,230.*

Tools and Attachments

Making Double-Cone Socket Joints. Hubert Inden, Dusseldorf, Germany. *Patent 1,794,407.*

Safety Guard for Machines. Michael J. McIntyre, Eden Center, N. Y. *Patent 1,794,469.*

Chuck. George G. Bush, Newington, Conn., assigned to Union Manufacturing Co. *Patent 1,794,511.*

Sand-Packing Device for Pipe Molds. Leon Louis Mathieu, Rouen, France, assigned to Societe Anonyme des Hauts-Fourneaux et Fonderies de Pont-A-Mousson, Meurthe-et-Moselle, France. *Patent 1,794,527.*

Device for Bending Pipe and the Like. Walter Estes Holsclaw and Harry Elston Holsclaw, Evansville, Ind. *Patent 1,794,689.*

Apparatus for Sizing Pistons. Hugh M. Rockwell, Freeport, N. Y. *Patent 1,794,797.*

Die Stock. Russell B. Tewksbury, Euclid, Ohio, assigned to The Oster Manufacturing Co. *Patent 1,794,806.*

Pneumatic Rivet Passer. William L. Gray, North Weymouth, Mass., assigned to Bethlehem Shipbuilding Corporation. *Patent 1,794,846.*

Threading Die and Holder. Edward A. Kane, Erie, Pa., assigned to Williams Tool Corporation. *Patent 1,794,963.*

Thread-Milling Cutter. Carl G. Olson, Chicago, Ill., assigned to Illinois Tool Works. *Patent 1,795,093.*

Processes

Electric-Arc Welding. Howard J. Burnish, Milwaukee, Wis. *Patent 1,794,363.*

Method of Producing Differentially-Tempered Metal. James Carey Davis, Chicago, Ill. *Patent 1,794,445.*

Process and Apparatus for Electroplating. Kevie W. Schwartz, New York, N. Y., assigned to United Chromium, Incorporated. *Patent 1,794,487.*

Coated Mold and Method of Preparing Same. Nelson J. Quinn, Toledo, Ohio, assigned to The Metal Castings Holding Corporation. *Patent 1,794,536.*

Method of Making Metal Pattern Equipment. Arthur K. Laukel, Detroit, Mich. *Patent 1,794,627.*

Roller-Bearing Cage and Method of Forming the Same. Henry Marles, Detroit, Mich., assigned to Gemmer Manufacturing Co. *Patent 1,794,634.*

Process of and Means for Manufacturing Nut Blanks. William Erastus Sharp, Chicago, Ill. *Patent 1,794,737.*

Method of Fractionally Plating Objects. Victor L. Soderberg, Detroit, Mich. *Patent 1,794,929.*

Continuous Method of Chromium Plating Metallic Wires or Strips. Byron V. McBride, Irwin, Pa., assigned to Westinghouse Electric & Manufacturing Co. *Patent 1,794,973.*

Method of Electroplating Zinc on Iron or Steel. Sidney H. Davis and Carl O. Anderson, Baxter Springs, Kan.; William N. Smith, Platteville, Wis.; and Herbert R. Hanley, Rolla, Mo., assigned to The Century Zinc Co. *Patents 1,795,079 and 1,795,080.*

TRADE PUBLICATIONS

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DEPRECIATION STUDIES. The U. S. Treasury Dept., Bureau of Internal Revenue, has issued a bulletin "Depreciation Studies." The booklet sets up rates of depreciation for many types of assets as a guide or starting point from which correct rates may be determined in the light of the experience of the property under consideration. Copies of the booklet are available from the Superintendent of Documents, Washington, D. C., for $0.05.

ELECTRICAL EQUIPMENT. The Condit Electrical Manufacturing Corporation, Hyde Park Station, Boston, Mass., has issued Industrial Control Catalog No. 5016 on circuit breakers and motor starters of the air and oil types and also on service switches.

HYDRAULIC PRESSES. The Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio, has published bulletin 2036, entitled "The New Hydraulic Way to Press Production," describing the H-P-M patented "Fastraverse" oil-pressure system.

SAW, TOOL AND FILE MANUAL. Henry Disston & Sons, Inc., Philadelphia, Pa., has compiled the "Disston Saw, Tool and File Manual," giving instructions in the selection, care and use of these tools and employing 229 illustrations.

TOOLROOM SPECIALTIES. The Taft-Peirce Manufacturing Co., Woonsocket, R. I., is distributing a leaflet on toolroom specialties, such as V-blocks, parallels, angle irons, and allied equipment.

UNIT HEATERS. The Young Radiator Co., Racine, Wis., has published booklet No. H-1230 describing a complete line of unit heaters, including both single-speed motor units and multiple-speed units, together with single-motor and dual-motor installations. Complete efficiency tabulations and installation diagrams are included.

HOISTS. The Wright Manufacturing Co., Bridgeport, Conn., has published a folder illustrating a new line of electric hoists, describing them in detail and listing the sizes.

VALVES. The American Car & Foundry Co., 5718 Russell St., Detroit, Mich., has issued Catalog No. 1 on "a.c.f." Milliken valves, giving a complete exposition of this new type.

WORK BENCHES. The Standard Pressed Steel Co., Jenkintown, Pa., is distributing a new bulletin, "Hallowell Steel Work-Benches and Steel Factory-Equipment," giving the list prices and sizes.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, March 12, 1931

VOL. 74 NO. 11

Educational Orders Deferred

HOPES that the bill authorizing educational orders would become law during the present session go glimmering with the passing of the Seventy-First Congress. The bill will repose safely and ineffectually in committee until revived for the forthcoming session in December. One can but trust that when it does come up for action, the need for unemployment relief will have passed. Educational orders can then be discussed rationally and unpolitically as a vital unit in the general plans for national security.

Appraising the Applicant

TRANSITION periods, during which employees displaced in one industry must be absorbed in another, seem inevitable. They may be caused by temporary dislocation of business or by more fundamental trends. The process of adjustment is often made unduly difficult by our present-day "scientific" employment methods, with their inevitable questionnaires. Usually the final judgment as to a man's fitness for an open position is based on "What was your last job?"

Undoubtedly, the practice of using a rigid yardstick to prospective employees is carried too far. A skilled man, handy with tools and measuring instruments, will learn the requirements of a new product in short order. But he finds it difficult to secure the opportunity to display his skill. Even for engineering positions, we constantly see advertisements qualified by phrases such as, "Must have long experience in this field." A man with an analytical mind, who is soundly grounded in engineering principles, is equipped to tackle a variety of work with assurance of success. Usually he is denied the chance. Let us judge the applicant on his basic qualifications rather than upon his immediate past experience. Then some of the lost motion will have been removed from the always difficult process of reallocation.

The Dole in England

FEW OF US are satisfied with soup kitchens, odd jobs, and similar provisions for the needy unemployed. These palliatives, as Dr. Royal Meeker so aptly calls them, afford no adequate nor lasting solution to a grave economic problem. Federal and state unemployment insurance have been offered as more thoroughgoing remedies. Figures have been compiled which prove superficially that certain schemes can well be borne by industry.

A recent memorandum by Philip Snowden, British Chancellor of the Exchequer, affords a view of the other side of the picture. This reveals a most vital need in England for reduction of the taxpayer's liability for unemployment relief. The unemployment fund, originally designed to be self-sustaining, was in debt $125,000,000 on April 1, 1928; it is estimated that this figure will be $375,000,000 on April 1, 1931. The indebtedness is increasing at the rate of $5,000,000 weekly. Talk of "writing it off," Mr. Snowden points out, is futile, since throwing the debt on the Exchequer merely puts it back on the shoulders of the taxpayer. Increased unemployment has reduced the fund's income while "transitional benefits" to those idle who did not qualify under the original plan, together with unreasonable and fraudulent claims, have led to England's present plight. The burden is so heavy that it greatly hinders business revival, thus forming a truly vicious circle.

One nation is slow to profit by the experience of another, but surely there must be a lesson for us in this spectacle. What assurance have we that unemployment insurance will be less of a political football on this side the Atlantic? Are our political leaders less demagogic than their English cousins? Is our Congress less susceptible to the lure of political grab bags and other vote-catching devices? Recent legislation supplies answers to these questions. Let us not slacken in our quest for more systematic provision for the unemployed. Let us not cast aside any reasonable proposal, even unemployment insurance. But before we let down the bars to even mild legislation, let us clearly recognize the pitfalls at our feet and effectively remove them before proceeding.

III—Promotion of National Prosperity

A—*The net profits of a modern business depend not only on its own activities but on sustained business stability throughout the country. There is a vital responsibility upon each business enterprise to do its share to provide national stability of purchasing power through—*

(1) A policy for employment.

(d) Set up a reserve to protect the security of employment in times of reduced production.

WHAT IS a surplus or reserve for, if it is not to tide a company, its stockholders, and its employees, over a period of reduced activity when income and expense fail to balance? It is common practice in conservatively managed enterprises to establish reserves for dividends, and to pay dividends from these reserves when current sales fall off, but only recently have a few companies applied the same philosophy to the payment of wages. Therefore, the suggestion from the McGraw-Hill check sheet (Supplement to *American Machinist*, Vol. 74, No. 10) for planning a company program, quoted above, will come as a relatively new idea to many company executives.

But is it not an absolutely logical proposal? In the past, a sharp distinction between salaried employees and wage earners has existed, but must it continue? Is there any reason why the shop should go on short time while the office continues on full time, except that management has failed to plan far enough ahead and to see to it that orders come in with some semblance of uniformity?

Older countries have met this problem by establishing elaborate systems of unemployment insurance, inforced by governmental authority and administered by armies of bureaucrats with customary bureaucratic alacrity (?); these systems have proved a heavy handicap to industry. In the United States, we have always insisted that business and industry were quite capable of conducting their own affairs without governmental interference; but the unemployment and resulting privation of many of our people during the past year has been disillusioning. If business is to continue to manage its own affairs it must increase its efficiency very materially.

To that end this suggestion is offered. It can be adopted and made effective by a single company. Witness the General Electric and Standard Oil plans. Or, better still, it can be put into effect by concerted action of the plants in an industrial community. Witness the Rochester plan, reported in *American Machinist*, Vol. 74, No. 9.

Community of effort attracts more attention, and rightly so, because the efforts of the more important plants in a city to stabilize employment reacts to the advantage of all and insures that all the sacrifices will not be made by one company, or by a small proportion of the total number of inhabitants. It should be a matter of congratulation for those in the metal-working industry that four of the fourteen Rochester plants to inaugurate the plan are machine tool plants, that most of the others are more or less closely connected with metal working, and that the chairman of the committee that set up the plan was a machine tool builder, James E. Gleason.

But whether the effort to accomplish this vitally important end be concerted or individual, there can be no question of the need for some effort. Not only will such effort be in harmony with modern thought on human relations, but it will also be commercially sound and politically expedient.

NEWS OF THE WEEK

A Lesson in Obsolescence

Remington-Rand's "demolition room," where, each year, thousands of obsolete machines, taken in trade and unfit for rebuilding, are destroyed and sold for scrap

Railway Tool Foremen Postpone Meeting

The nineteenth annual convention of the American Railway Tool Foremen's Association, tentatively scheduled to be held in Chicago in September, has been postponed until September, 1932. This action was taken at the request of the General Committee appointed by the Mechanical Division of the American Railway Association.

Civil Service Examinations

Recent Civil Service Examination announcements include the following: Assistant Naval Architect at $2,600 per year; Associate Engineer at $3,200 to $3,700 a year; Assistant Engineer at $2,600 to $3,100 a year; Principal Engineering and Inspector-Superintendent at $2,300 to $2,900 a year; and Senior Engineering Inspector-Foreman at $2,000 to $2,600 a year. Applications must be on file by April 1 by the U. S. Civil Service Commission at Washington, D. C.; where further information is available.

Railway Equipment Expenditures Up

Capital expenditures made by the Class I railroads in 1930 for new equipment and additions and betterments to property used in transportation service were the greatest for any year since 1926, according to complete reports for the year just received from the rail carriers by the Bureau of Railway Economics. Capital expenditures actually made in 1930 totaled $872,608,000, an increase of $18,887,000 above such expenditures in 1929 and an increase of $195,943,000 above those in 1928. They were also an increase of $101,056,000 above those made in 1927, but a reduction of $12,478,000 under 1926.

The amount of capital expenditures devoted to purchase of equipment in 1930 was $328,269,000, as compared with $321,306,000 in 1929. This was an increase of $6,963,000 or 2.2 per cent.

THE American Standards Association, as a member body of the International Standards Association, has been informed that the next conference of secretaries of national standardizing bodies and a series of meetings on technical subjects will be held in Copenhagen, Denmark, in May, 1931. Subjects to be taken up include aeronautics, drawings, ball bearings, agricultural machinery, rivets, metric screw threads, metric bolts and nuts, fits between cylindrical parts, steel, and iron.

A.S.M.E. Plans Old World Tour During Coming Summer

THE American Society of Mechanical Engineers is offering to its members and their guests, in connection with the 75th Anniversary of the Verein Deutscher Ingenieure, a personally conducted all-expense tour of Europe. The itinerary has been arranged to include England, France, Germany, Italy, and Switzerland, taking in particularly the great industrial centers, brilliant capitals, ancient art and architectural treasures, places of great scenic beauty, and similar spots.

The Verein Deutscher Ingenieure has planned an outstanding meeting for the celebration of its 75th Anniversary, and has included a number of excellent technical sessions, excursions to points of technical and scientific interest, and similar events. The itinerary gives June 13 as the date of starting aboard the White Star *S. S. Adriatic* to Queenstown, Ireland. Subsequent points in order of their being visited are Liverpool, Leamington, London, Harwich, Cologne, Biebrich, Wiesbaden, Heidelberg, Eberbach, Neckarelz, Adelsheim, Rothenburg, Ansbach, Nuremberg, Munich, Innsbruck, Venice, Florence, Rome, Genoa, Milan, Como, Bellagio, Lugano, Lucerne, Interlaken, Montreux, Paris, and Boulogne. The tourists will return home on the Hamburg-American *S. S. St. Louis*, arriving in New York on Aug. 5. The total cost is expected to be $775 per person.

Survey of Industrial Machinery Situation Presented by Commerce Department

WASHINGTON, D. C., March 10—The world absorbs annually about $5,500,000,000 worth of industrial machinery, of which the United States produces 57 per cent, Great Britain and Germany each about 13 per cent. Each country employs about 500,000 workers in its machinery producing industries; consequently, the production per worker is about four times as great in the United States as in Europe, an advantage which should benefit us. About $1,000,000,000 worth of machinery enters international trade each year, the United States furnishing approximately 35 per cent of the total, machinery being one of our most important export commodities. In fact, metal-working machinery ranked first in among the various types of American industrial machinery exported in 1929 and 1930—making this branch of our export trade of decided importance. Yet the business cycle plays hob with the machinery industry, the profit experience of machinery manufacturers is decidedly unsatisfactory, and other features of their situation are not what they should be. Why? The Industrial Machinery Division of the Department of Commerce has tried to answer the question in the booklet "Industrial Machinery, 1930" just issued.

The booklet shows, among other things, that 51.8 per cent of the metal-working machinery builders reported no income in 1924, 38.8 in 1926, and 39.8 the following year. Further, the machinery industry is either prince or pauper, depending upon whether we enjoy prosperity or suffer depression. An accompanying chart graphically portrays the trend of machine-tool orders, as compared with the status of general business. A more adequate understanding of the action of this cycle, particularly as it relates to machine tool fields, might lead to a new method of pricing, a subject upon which comparatively little is known at present.

The world absorbs about $5,500,000,000 worth of industrial machinery annually—quite a bit of machinery—still releasing the same type of social, economic, and political forces that were released in England at the beginning of the Industrial Revolution, a matter of great consequence.

The booklet shows further that the individual American worker produces $5,200 worth of machinery annually, in Great Britain $1,432, in Germany $1,527. A 1925 comparison of German and American machine establishments, while favoring us in production per worker, shows our comparatively unfavorable export position. One item, "Horsepower per worker," may be the secret of our manufacturing advantage. Germany employs 1.04 hp. per worker, we employ 3.38. If this is the secret, does it not indicate the basis for better sales efforts, both here and abroad? This line of thought suggests not only the desirability of more liberal use of machinery in industry, but also more careful attention to the problem of obsolescence.

Thus the problems multiply. Careful scrutiny of the booklet and direct application of the findings to the individual tool builder may yield some surprising results. The booklet is No. 111 of the Trade Promotion series, and is available from the Superintendent of Documents, Washington, D. C., for 15 cents a copy.

British Celebrate Maudslay Centenary

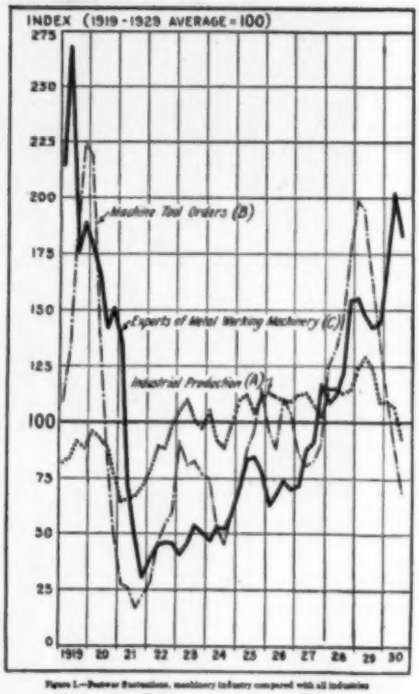
BY OUR ENGLISH CORRESPONDENT

The centenary of the death of Henry Maudslay, inventor of the screw-cutting lathe and thus indirectly of most modern machine tools and precision engineering, was celebrated at Woolwich, England, recently by a special service in St. Mary's Church, where he was married, followed by the placing on his tomb (designed by himself, and made of cast iron) of a chaplet from the Newcomen Society, which had initiated the commemoration, and another from the Waterloo Lodge of Freemasons, of which Maudslay had been a member. The actual placing of the wreaths was done by the Mayoress of Woolwich. The Mayor and Corporation were guests, as were Joseph Maudslay, a grandson of the great engineer, with two other grandsons, a great-grand-daughter, and two great-great-grandchildren, as well as descendants of his associates of a century ago, and representatives of the Newcomen Society, the Institution of Mechanical Engineers, the Junior Institution of Engineers (which originated in the Maudslay shops nearly 50 years ago), and other professional and technical bodies.

HENRY MAUDSLAY

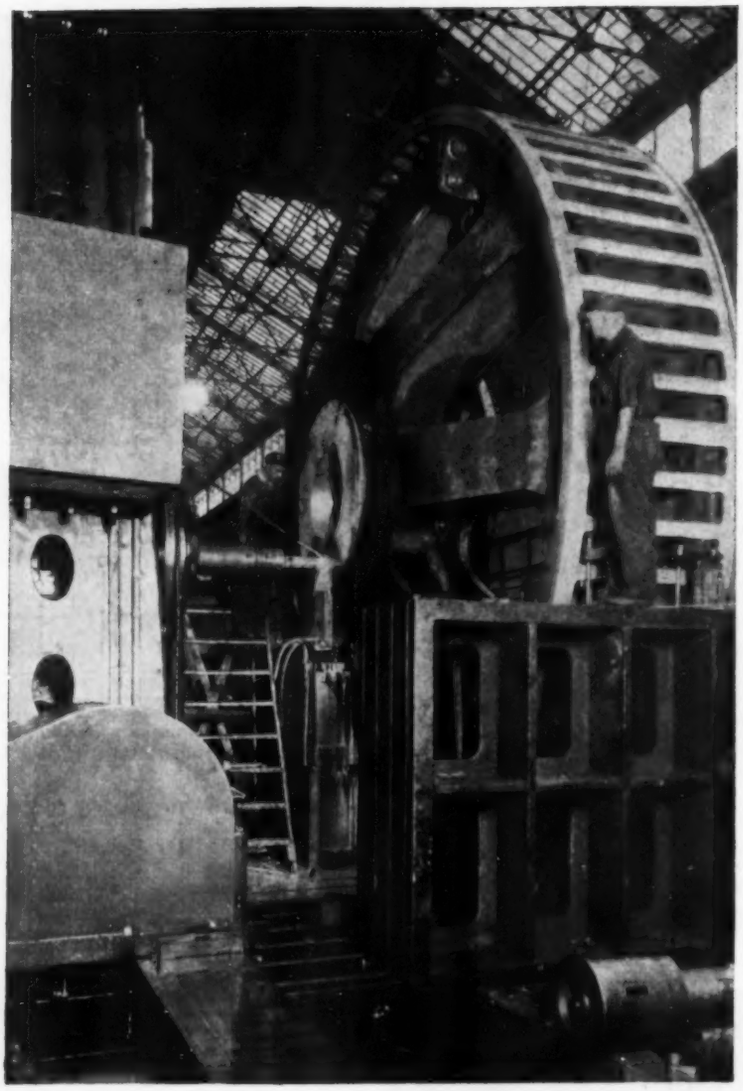
A historic survey of Maudslay's career was delivered by F. Carnegie, Chief Superintendent of the Ordnance Factories at Woolwich Arsenal, from which it was noted that although Maudslay's name is so intimately (almost exclusively) associated with Woolwich and London, he actually came of Lancashire stock.

The manufacture of spinning machinery is so essentially precision work that it may well be said that Maudslay fathered the industry no less than, by his addition of the cup-leather packing to Bramah's hydraulic press, he made hydraulic engineering possible, and by his slide rest and screw-cutting lathe (the original of which, his own handiwork throughout, stands in the library of the Institution of Mechanical Engineers, London), he laid the foundations for the work of his great pupils and successors in machine tool invention—James Nasmyth and Sir Joseph Whitworth.



Postwar fluctuations, machinery industry compared with all industries

THE Seattle Equipment Distributors' Association recently elected the following officers: J. B. Stam, Manager of the Clyde Equipment Co., president; H. B. Fay, Manager of the Western Tractor & Equipment Co., vice-president; Clayton De Wolfe of the Polson Implement Co., secretary-treasurer. The Association was formed two years ago, and includes in its membership 17 of the larger machinery and equipment firms in Seattle.



90,000-lb. cast spider, 20 ft. in diameter, 4 ft. thick, being drilled at the Westinghouse East Pittsburgh Works. The 4-in. hole will be tapped for a 4-in. handling bolt. The spider is part of a 23,000-kva. generator for the Osage development west of St. Louis

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Industrial Profits Show 50% Decline

Annual reports for 1930, published by some 900 industrial and merchandising companies, show that net profits were approximately 40 per cent below those of 1929 and 28 below those of 1928, according to the survey of the National City Bank, New York. Aggregate net profits of the group were $2,097,000,000 in 1930, as compared with $3,470,000,000 in 1929 and $2,929,000,000 in 1928. 19 automobile companies had net profits of $169,780,000 in 1930, as compared with $348,318,000 in 1929, a decline of 51.3 per cent. Their capital and surplus increased 9.9 per cent. 39 auto accessory makers reported 1930 net profits of $32,832,000, as compared with $81,712,000 in 1929, a decline of 59.3 per cent, while their capital and surplus increased 18.5 per cent. 28 electrical equipment makers had profits of $80,688,000, as compared with 133,515,000 in 1929, a decline of 39.6 per cent, while their capital and surplus increased 18.1 per cent. 40 iron and steel producers had 1930 profits of $178,649,000, as compared with $369,239,000 in 1929, a decline of 51.6 per cent, while their capital and surplus increased 13 per cent. 56 machinery and tool builders had 1930 profits of $29,373,000, as compared with $55,385,000 in 1929, a decline of 47 per cent, while surpluses increased 9.4 per cent. 18 railway equipment builders showed 1930 profits of $53,315,000, as compared with $58,315,000 in 1929, a decline of 8.6 per cent, while capital and surplus increased 4.3 per cent.

A.M.A. Plans Marketing Conference

Arrangements have now been completed for the Industrial Marketing Conference of the American Management Association at Washington on March 19 and 20. Headquarters will be at the Hotel Washington, 15th St. & Pennsylvania Ave., Northwest, the program beginning at 9 A.M. on March 19. The group at the conference will visit the Bureau of the Census where the men in charge of various departments of the census will explain their respective divisions. After a visit to the White House and luncheon at the Washington Hotel the afternoon program will include visits to the Bureau of Mines and Bureau of Standards. The next morning's meeting will include a visit to the Bureau of Foreign & Domestic Commerce with a luncheon at 12 o'clock with individual government officials. The afternoon will be free for personal conferences.

Expenditures For Industrial Research

Research expenditure per plant for all industries in the United States averages $44,500, according to the National Research Council. Expenditures for research per plant per year for some of the more important industries are as follows:

Industrial Group	Average Annual Research Expenditure
Chemical and allied products	$105,000
Automobile	**100,000**
Rubber and its products	100,000
Metal-working plants	**68,300**
Food and kindred products	47,000
Paper and pulp	38,400
Textiles	20,000
Rolling mills and steel plants	16,200
Leather and its products	15,200
Lumber and its products	13,600

The average expense for research in per cent of capital invested for all industries for which data was available was 1.03 per cent. The range of variation was from 0.04 to 2.04 per cent.

Steel Founders Meet at Columbus

General sessions and meetings of special divisions of the Steel Founders Society of America at the March meeting in Columbus, Ohio, will be held on the 19th. The entire day of the 20th will be given over to a discussion of the industry's sales problems, with upwards of 300 steel castings salesmen and sales managers from all parts of the country expected to be present. E. St. Elmo Lewis, nationally known expert on merchandising and sales promotion, will be in charge. W. H. Worrilow, President of the Society, and W. W. Powell will preside at the regular meetings. John J. Baum, engineer and metallurgist, will speak to the Small Castings Division on "New Uses for Cast Steel." Professor W. Trinks will present a paper: "Selection of Materials in Machine Design."

Plans Laid For Metals Meeting

H. D. Sayre, Commissioner of the National Metal Trades Association, and J. E. Myhan, Secretary, were in Cincinnati Feb. 26, making arrangements for the annual convention of that organization, which will be held in that city on April 15 and 16, with headquarters in Hotel Sinton. On the two days preceding the meeting there will be conferences of officers and executives of the different branches. An interesting feature of the convention will be an exhibit of the best work done by apprentices of different concerns. On each day of the meeting there will be a fleet of automobiles available to visitors to take them to plants they may desire to visit.

CHANGES in regulations governing the valuation for imports into Canada of steel, tools, dies, patterns, and welding compounds will be sought by the Border Chamber of Commerce in conjunction with industries effected in an effort to further protect Canadian industry and help solve the unemployment situation. Following the successful campaign in connection with the valuation of automobiles, steps are now being taken to impress on the Government the need of further action. It is expected that auto parts and accessories will be given attention at the next session of Parliament.

BUSINESS ITEMS

The Fuller Lehigh Co., 85 Liberty St., New York, N. Y., has moved its general offices to the above address from Fullerton, Pa., and transferred manufacturing operations formerly carried on at Fullerton to Barberton, Ohio.

The General Electric Co., has sold its trolley material business to the Ohio Brass Co., Mansfield.

The Diamond Machine Co., Providence, R. I., has appointed The Cleveland Duplex Machinery Co., Penton Bldg., Cleveland, Ohio, as exclusive dealer in that area.

The Watson-Stillman Co., Roselle, N. J., has purchased the assets and business of the Burroughs Co., Newark, N. J., which has specialized for many years in the design and building of plastic molding hydraulic machinery. The Watson-Stillman Co., will continue with this line of tilting head and rodless hubbing presses, and celluloid working machines.

The Allsteel Press Co., 12015 South Peoria St., Chicago, Ill., has been organized to manufacture "Verson" all-steel punch presses, forging presses, press brakes, forming dies, and other metal-working machinery of arc-welded, steel-plate construction. The personnel formerly associated with the LaSalle Machine Works, Inc., Chicago, is in complete charge of the management and operations, but larger quarters have been acquired.

The Lewyt Metal Products Co., 120 E. 13th St., New York, N. Y., a division of the Novelty Wire & Metal Works, has been organized to specialize in the manufacture of stamped, formed, pressed, welded, and fabricated sheet steel products. The parent company has been manufacturing metal and wire products for more than 47 years.

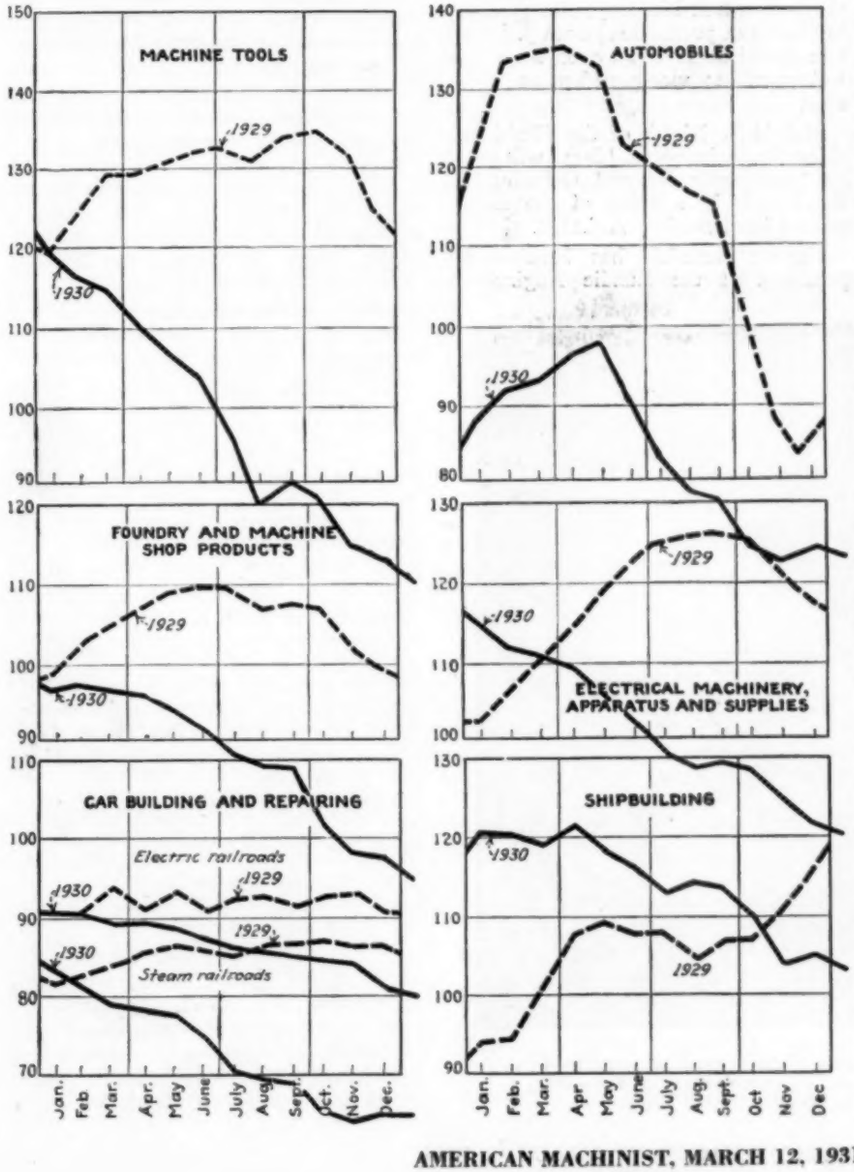
The Canadian Metal Products Co., Guelph, Ont., subsidiary of Steel & Tubes Inc., Cleveland, Ohio, has sold to the Burlington Steel Co., Ltd., Hamilton, Ont., its entire equipment, inventory, and good will. H. W. Hinman, formerly manager of the Guelph plant, has joined the staff of Burlington Steel in charge of the tubing division, and all equipment will be moved to Hamilton immediately.

The Autogiro Specialties Co. has been organized with offices at 900 Victory Bldg., 1011 Chestnut St., Philadelphia, Pa., for the purpose of manufacturing and selling Autogiro accessories under patents and license of the Pitcairn-Cierva Autogiro Co. of America. Joseph S. Pecker, chief engineer of the Machine and Tool Designing Co., who developed the rotor hubs and self-starters under the direction of the Pitcairn-Cierva organization, will also be chief engineer for the Autogiro Specialties Co., and will be in charge of design and sales, according to Harold F. Pitcairn, who will be president of the new organization.

Trend of Employment In the Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly average for 1926 = 100



Strutz & Mead, Inc., Milwaukee, has been incorporated by Walter F. Strutz, Ellis D. Mead, and Norman R. Klug to become tool manufacturers' agent.

The Air Reduction Co. Inc., New York, has purchased the controlling interest in the Wilson Welder & Metals Co., North Bergen, N. J.

The merger of the Millers Falls Co. and the Goodell Pratt Co., Greenfield, Mass., was consummated last week. The West Haven (Conn.) Manufacturing Co., subsidiary of the Millers Falls Co., manufacturing hack saws and small tools, is included in the deal and the business will be moved to Greenfield.

The Stuebing Automatic Machine Co., makers of metal-edging equipment for printers and lithographers, has moved its factory from Springfield, Ohio, to Cincinnati, Ohio, at 2425-27 Spring Grove Ave.

The Haskelite Manufacturing Corporation, 120 S. La Salle St., Chicago, has moved its New York office to the Knickerbocker Bldg., 152 W. 42nd St., Suite 1115. Joseph A. Potchen has been transferred to the New York territory to succeed James J. Dunne.

The Batavia (Ill.) Body Co., has been incorporated with $250,000 capital for the manufacture of auto bodies. W. H. Forest, T. Jackson, and C. M. Vogel, all of Rockford, are the incorporators.

Receivers for the Wickwire Spencer Steel Co., will purchase the Goddard plant for $500,000 instead of $1,500,000, the former purchase price, according to a recent agreement. Annual rental, previous to the purchase, has been reduced from $230,000 to about $35,000.

PERSONALS

Austin L. Adams has been elected to the board of directors of the Bristol Co., Waterbury, Conn., to fill the vacancy left by the late W. R. Bristol.

Ralph E. Flanders, Vice-President of the A.S.M.E., and manager of the Jones & Lamson Machine Tool Co., Springfield, Vt., will speak on "Some Phases of the Present Economic Situation as it Pertains to Unemployment" at the March 30 meeting of the Syracuse local section, A.S.M.E.

Samuel M. Vauclain, Chairman of the Board, Baldwin Locomotive Co., will speak on "The Modern Locomotive and the Development of the Water Tube Boiler" at the March 12 meeting of the Baltimore local section, A.S.M.E.

Hugh L. Adams of Philadelphia and James A. Wright of Springfield, Mass., have been added to the directors' board of the Indian Motocycle Co., Springfield, Mass.

Frank N. Ames has been elected president of the Aero Supply Corporation, Corry, Pa., succeeding George I. Stich, resigned. Other officers elected are Leonard T. McElroy, vice-president in charge of production; Sam J. Irvine, vice-president in charge of sales, and Luke Graham, vice-president and treasurer.

Harold L. Blood, of the Heald Machine Co., Worcester, Mass., will speak on "Automatic Internal Grinding" at the March 19 meeting of the Metropolitan local section, A.S.M.E.

Eugene Brandeis has been elected president of the Lundie Engineering Corporation, New York, to succeed the late Dr. John Lundie. L. B. Armstrong has been elected vice-president.

Walter W. Bricka, General Manager and a director of the Goodell-Pratt Co., Greenfield, Mass., will resign on March 31. Mr. Bricka, who is an associate of the Ellery A. Baker Co., Industrial Managers, New York City, has for the past two years managed the Goodell-Pratt Co., and is terminating his services with the merger of the Goodell-Pratt and Millers Falls Tool Companies which he furthered.

W. B. Caldwell has resigned as general superintendent of the Sharon (Pa.) Steel Hoop Co.

Thomas Cocker, formerly Cleveland manager for the Chain Belt Co., Milwaukee, has been transferred to Buffalo. He will succeed Frank Gary, who has been transferred to St. Louis to succeed J. M. Smallshaw, now manager of the Cleveland territory. Hy Bergis was transferred from Seattle to Portland, Ore., and Gerald Nichols has been transferred to Seattle. W. F. Nichols is Northwest manager.

M. P. E. Dalbouze, President of the Federation of French Metallurgical Industries, is visiting in this country as a guest of the Harvard School of Business Administration.

Charles Drum, formerly chief inspector of the Murray Corporation of America, has been made general superintendent to succeed William Klan. C. F. Coda, whose appointment as manufacturing manager was recently announced, will remain in charge also of the Ecorse Plant and Jenks and the Muir Manufacturing Co.

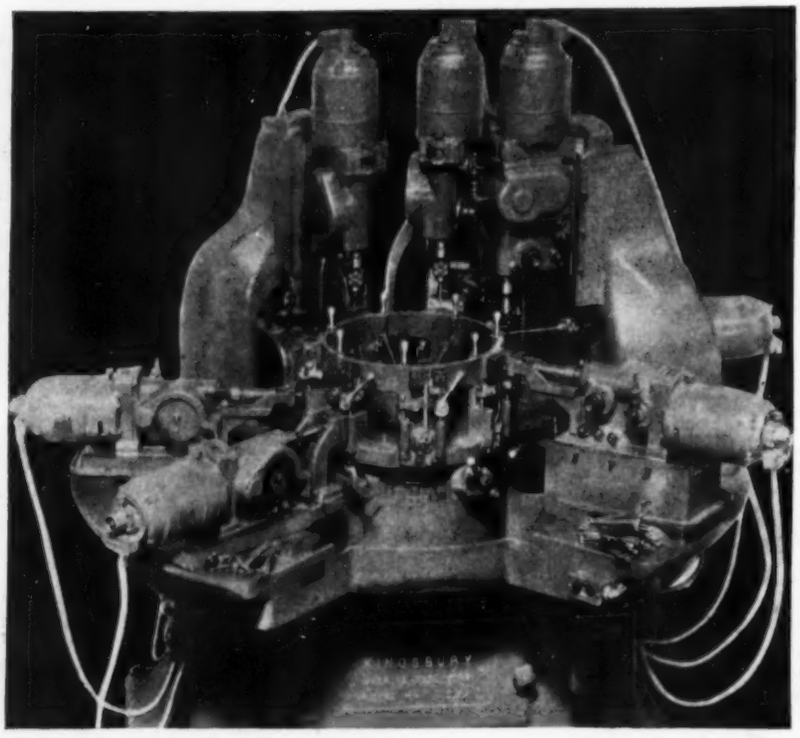
Fred L. Flanders, Executive Vice-President of the Houdaille-Hershey Corporation, Detroit, has been elected president and a member of the board of the Jackson (Mich.) Motor Shaft Co., to succeed Otto S. Schultz, resigned. Other officers include: T. M. Carpenter, vice-president and general manager; Melville C. Mason, secretary; M. D. Harrison, treasurer, and M. Rosenberger, assistant treasurer.

Dr. William J. Foster, 70, Schenectady, N. Y., has received the Lamme Medal of the A.I.E.E., "for his contributions to the design of rotating alternating current machinery." The medal will be presented at the Summer Convention of the Institute in Asheville, N. C., June 22-26. Dr. Foster is a retired consulting engineer of the General Electric Co.

Nelson S. Gotshall has been appointed assistant to Pres. A. G. Bean of the White Motor Co., Cleveland. Mr. Gotshall was formerly assistant sales manager of the Bishop & Babcock Manufacturing Co., Cleveland.

H. B. Harvey has been elected a director of the Muncie (Ind.) Gear Co., to succeed A. R. Clarke, resigned.

L. W. Kempt of the Aluminum Co. of America, will speak on "Aluminum and Its Alloys" before the Utica Local Section, A.S.M.E. on March 18.



Kingsbury combination drilling and tapping machine, equipped with 10 Westinghouse motors, built for installation in a sewing machine factory in the United Socialist Soviet Republics

Clark P. Pond has been appointed vice-president of engineering and sales of the Truscon Steel Co. He was formerly connected with the David Lupton's Sons Co. in a similar capacity.

J. F. Griswold has been named president and a member of the board of the Foote Bros. Gear & Machine Co., Chicago, to succeed W. C. Davis. A. B. Wilder has been named a member of the board. Other new officers chosen by directors are: F. A. Emmons, vice-president; A. L. Gray, secretary and treasurer; J. R. Fagan, assistant treasurer, and O. R. Moss, assistant secretary. W. A. Barr and H. A. Bates were re-elected vice presidents.

Frank J. Jeschke has joined the Hutto Engineering Co., Detroit, as sales engineer. Mr. Jeschke was one of the originators of production cylinder honing and was with Hutto from the beginning of the company in 1923 to 1927, when he formed his own company, the Jeschke Tool Corporation, later merged with the Micromatic Hone Co.

Harold B. Reid, formerly purchasing agent for the Wallace Barnes Co., Bristol, Conn., has been elected vice-president and general sales manager to succeed the late Brown Joyce. H. C. Barnes, treasurer, takes over the duties of purchasing agent.

Dr. Ancel St. John of the St. John X-ray Corporation spoke on "Non-Destructive Tests of Welds" at the joint meeting, New York Section, American Welding Society and the New York Chapter of the A.S.S.T. on March 9. Dr. A. V. DeForest of the Welding Engineering & Research Corporation spoke on "Magnetic Inspection of Steel Products" and Dr. R. F. Mehl of the Naval Research Laboratory spoke on "Gamma-Ray Inspection of Heavy Welded Structures." J. J. Crowe of the Air Reduction Sales Co., was the presiding officer.

James W. Witmer, Sales Manager of the J. I. Case Co., Racine, Wis., since 1916, has been made assistant to C. R. Messinger, President of the Oliver Farm Equipment Co., South Bend, Ind.

C. K. Woodbridge, New York City, has retired from the board of directors of the Greenfield Tap & Die Corporation, Greenfield, Mass., and has been succeeded by Jarvis Williams, Jr.

OBITUARIES

E. G. Askerman, 55, Superintendent of the Dayton (Ohio) Castings Co., died as a result of an automobile accident Feb. 27.

Francis E. Bacon, 78, formerly president of the Fulton (N. Y.) Machine Co., died recently in Los Angeles, Cal., where he had resided since retirement several years ago.

Orville P. Blake, Kansas City District Sales Manager for the Inland Steel Co., died at Denver, Colorado, Feb. 25 of pneumonia. Mr. Blake joined the Inland sales staff in 1906.

George W. Bowen, 67, founder and for many years president and treasurer of the Bowen Products Corporation, Auburn, N. Y., and president of the firm of Henry & Allen, Inc., automotive electrical manufacturer, died recently at his winter home in Pasadena, Cal.

Rodney D. Briggs, founder of the Briggs Manufacturing Co., Detroit, Mich., died in St. Petersburg, Fla., March 5, after a month's illness.

William B. Eisert, Superintendent of the foundry of the Pennsylvania Boiler Works, Erie, Pa., died recently at his home in that city after a short illness. He had been superintendent of the foundry since it opened 38 years ago.

Albert H. Ellis, 65, retired inventor and mechanical engineer, died of heart disease on Feb. 26 at his home in Montclair, N. J. He, at one time, was employed by the Remington Typewriter Co., New York, and one of his best known inventions was an adding machine for use with the typewriter.

William E. Elliott, 64, President of the Elliott Machine Corporation, Grand Rapids, Mich., died Feb. 25 in Lynn, Mass. He founded the Elliott Corporation 40 years ago.

George J. Mockley, 72, President of the South Seattle Foundry Co., Seattle, Wash., died there Feb. 24.

Harry P. Readmon, 53, Purchasing Agent of the Chicago Pneumatic Tool Co., Chicago Pneumatic Bldg., 6 East 44th St., New York, N. Y., for the past twelve years, died Feb. 26.

George F. Spencer, 78, who retired last year as chairman of the Frink Co., Inc., New York, died Feb. 25 in Upper Montclair, N. J.

Adrian P. Sloan, 84, Chairman of the Board of the Cushman Chuck Co., Hartford, Conn., died Feb. 21 at Hartford.

Lucius Morton Wainwright, 71, President of the Diamond Chain & Manufacturing Co., Indianapolis, died recently at Miami Beach, Fla.

Samuel J. Weil, retired founder and head of the Union Aluminum & Smelting Co., New Haven, Conn., died there March 8 after a year's illness.

Charles de Wendel, Director of the Wendel Foundries, Hayange, Lorraine, France, from 1903 to 1911, formerly one of the leading French steel manufacturers, died March 3 in Touraine.

FORTHCOMING MEETINGS

AMERICAN SOCIETY FOR TESTING MATERIALS — Annual Spring Group Committee meeting, Pittsburgh, March 16-20. C. L. Warwick, Secretary-Treasurer, Engineers Club Bldg., 1315 Spruce St., Philadelphia.

STEEL FOUNDER'S SOCIETY OF AMERICA—Sales clinic and regular meeting, March 19-20, Neil House, Columbus, Ohio. G. P. Rogers, Managing Director, 932 Graybar Bldg., New York City.

THREE-M-CONGRESS — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18, 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., N.Y.C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Calvin W. Rice, executive secretary, 29 West 39th St., New York. The following meetings are scheduled:

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Aeronautic Meeting, Baltimore, Md., May 12-14, 1931.

National Applied Mechanics Meeting, Purdue University, Lafayette, Ind., June 15-16.

AMERICAN FOUNDRYMEN'S ASSOCIATION—Annual convention and exhibition, Stevens Hotel, Chicago, May 4-8, 1931. C. E. Hoyt, 222 West Adams St., Chicago, secretary.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION—Annual Spring Meeting, Hotel Statler, Buffalo, May 7-9, 1931. T. W. Owen, 3608 Euclid Ave., Cleveland, secretary.

NATIONAL FOREIGN TRADE COUNCIL—Annual Convention, May 27-29, at the Hotel Commodore, New York City. O. K. Davis, secretary, 1 Hanover Square, New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION—Annual Conference, Production Division, Rochester, N. Y., June 1-2. Headquarters, 20 Vesey St., N. Y. C.

NATIONAL ASSOCIATION OF PURCHASING AGENTS—Annual Convention and Informashow, Royal York Hotel, Toronto, Canada, June 8-11. G. A. Renard, Secretary-Treasurer, 11 Park Place, New York.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual Meeting, Stevens Hotel, Chicago, June 22-26. C. L. Warwick, 1315 Spruce St., Philadelphia.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Annual Summer Convention, June 22-26, Asheville, N. C. F. L. Hutchinson, 33 West 39th St., New York, N. Y., secretary.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

NEW YORK

Optimism prevailed in the New York market last week. Inquiries, quotations, and prospects were the reasons. Possibilities of sales continue to develop, and tool dealers are keeping hot on the trail. There are increasing numbers of requests for large tools, one dealer receiving two inquiries for a $19,000 machine from widely separated sources within a day. The reassuring thing is that these inquiries mean business as soon as American industry can be convinced that the scare is over. Sales are holding about even generally, and as usual are better for certain dealers.

PHILADELPHIA

So far as actual orders are concerned, the situation is unchanged. Some dealers, however, profess to see in Pandora's box something for the future besides mere hope, and they are buoying their feelings accordingly. Railroads may soon be in the market, principally the Pennsylvania and some of the smaller lines in the South. During the last fortnight there were a few replacement orders from general industrial establishments. There are hopes of early buying from shipyards.

CLEVELAND

Sales of machine tools continue at the average of the past six weeks. Orders booked are usually for one or two tools, to be used principally for replacement purposes, and represent a generally diversified list of buyers. Electrical appliance, automobile, accessory, rubber tire, and machine shop interests are leading buyers. Inquiries are improving, both in number and quality. Lists for the Dayton airport, Canton Steel Co., and rubber tire concerns are expected to close in the next fortnight. February showed gains over January, and March is expected to exceed either month in sales.

NEW ENGLAND

The machine tool market registers tedious progress in the face of spasmodic buying. Inquiries show an increase, but builders see no encouragement for immediate closings. Wide and diversified potential demand is harnessed by hesitant buyers. February sales failed to reach the anticipated mark. Most houses that showed January improvement did about as well in February; some a little better. March must show much greater improvement to restore normal buying confidence.

Few are willing to forecast what the next few months may develop. Most all admit there is a better business sentiment, and believe December was the low month. Surveys in all sections denote real industrial progress. Since the first of the year in Connecticut alone at least fifty concerns have had their best months in a year.

CINCINNATI

Having received a number of orders in the past few days, one manufacturer states that the business sky looks quite rosy. Others note no change but still look forward to a general brightening up ere the month is over. Selling agents are booking an occasional order, but their main success is in developing prospects that sooner or later must result in sales. One fair-sized order is reported from the automotive field. Other orders received in the week were well scattered over the country and well diversified, the greater portion coming from general machinists and miscellaneous users, whose requirements in the main were single tools and replacements. Considering the state of the market, a good number of inquiries were received, and in a few cases there was an encouraging increase in the number and tone.

■

BUSINESS' old swimmin' hole, growing daily more inviting as Spring approaches, still holds terrors for purchase-order signers grouped about its edge. All are shrieking "Fraidy Cat!" at the top of their lungs, but no one offers to lead the way in. Thus the market maintains its slow warming process, with increasing numbers of inquiries indicating business' readiness to take the plunge if someone will just lead the way.

NEW YORK sales are holding about even, while inquiries, quotations, and prospects increase momentarily, many of them for large units. Philadelphia, anticipating early railroad and shipyard orders, continues on the same level. Cleveland is in the same boat, but has lists from the Dayton Airport, Canton Steel Co., and several rubber concerns, better February sales, and orders from electrical appliance, automobile, accessory, rubber tire, and machine shop interests. New England inquiries are still coming up, but the section awaits a leader, forgetting that when business begins again, machine tool prices are going up—and sharply. Cincinnati has one manufacturer with many recent orders, others holding about even, with selling agents busy developing prospects.

SOUTHERN DISTRICT is at last showing improvement, though hesitancy is still rampant. Detroit orders are spotty, while general business continues its improvement there. Chicago inquiries show a decline, sales are holding even, grinders are going well to automotive interests, and the University of Chicago is getting ready to buy its list. Milwaukee reports a slight February improvement, schools having lists out and General Electric and other electrical buyers expected to release lists shortly. Buffalo's used tool demand is concentrated on small lathes; other business is slowly improving.

SOUTHERN DISTRICT

Some improvement in the machinery and machine tool market was noticed during the past fortnight. While the trend is not very pronounced, the upward swing after months of quietness finds an earnest trade soliciting in a needy market. Many projects involving both new equipment and used machinery and tools of the better type have been withheld due to the "pulling-up" attitude of business executives.

Few sales of importance were noted the past two weeks. Small tools accounted for the bulk business of jobbers, and lists out were confined to jobbers' stocks on hand. Conditions are about uniform throughout the area.

DETROIT

While automobile production is steadily increasing and the general business and industrial outlook is becoming more and more optimistic, the improvement noted in the machinery and machine tool trade in the last few weeks is still very spotty. Some orders are being received, inquiries are increasing in number and buyers are generally more open minded and more accessible than they were at the first of the year. There has been no radical improvement in business, however, and machinery dealers are waiting for an increase in automobile production in the belief that this will release a large volume of orders.

Most representative dealers have a great deal of potential business on hand. There are many jobs planned, many machines and tools designed and all but purchased.

The trend of the automobile business in the next 30 days will have a powerful influence on the machinery trade.

CHICAGO

With inquiries showing a slight decline, and bookings failing to reveal improvement, machine tool business remains at practically the same level as for some weeks past. No additional railroad lists are reported, and there is some talk of scaling down by two of the roads whose lists are in the hands of the trade. In one or two lines, business is reported to be rather better than holding its own. In the case of grinding machinery, one of the largest Mid-West manufacturers has sales for the past two months exceeding by 10 per cent those of the same period in 1930, the automobile industry taking the major part of the plant's output. The University of Chicago, which late in February sent out a lengthy list of tools and accessories needed in the shops of the Oriental Institute, is getting ready to close on some of the items listed. These include bench millers and lathes, a drill press, a portable crane, and a number of woodworking machinery accessories.

MILWAUKEE

In general February showed a slight but apparentiy permanent improvement over January. Prospects for March are favorable. There is a better feeling in most quarters; inquiries are improving, and many of them are closer to the closing point. It is pointed out that financial positions of many buyers are in a favorable condition and that purse strings should be opened soon.

Improvement in the Detroit automotive situation is taken here to indicate that some placement will be made before the end of March. Trade and technical schools have lists pending indicating larger purchases this year than in 1930. General Electric and other electrical buyers are looked to for releasing large lists shortly.

BUFFALO

The machine tool outlook is somewhat better. With one or two exceptions, all reports are more favorable, showing a per day business for February somewhat ahead of that for January.

Different dealers report different conditions. Some report that practically all business is coming from small companies while one outstanding dealer asserts that the bigger industries are at last buying, and that he has had three large sales and and several smaller ones in the last few weeks from industries in the largest group.

The demand for used equipment is concentrated chiefly on small lathes for general use. Evidently the supply of used lathes is not sufficient to meet the demand.

BUSINESS • BAROMETER

The outlook is satisfactory, and gradual improvement in business tone is probable, if not assured

THEODORE H. PRICE
Editor, Commerce and Finance, New York

WRITING of America before the World War, Max O'Rell said that Americans ought to be thankful because theirs is a country in which real news is scarce, and people are able to pursue their activities without distraction. The markets and business reports of last week remind one of O'Rell's observation. If the adjournment of Congress be excepted, there have been no sensational developments. Congress appropriated over ten billion dollars during its two-year term. This is about five times the cost of the Government for an equal period in McKinley's time, and the probability of tax increases is viewed with apprehension by many. But the tendency toward increased expenditures cannot be checked, although it may be possible to decelerate it by constant protest.

By those who urge us to "live in the living present" the appropriations voted by Congress will be encouraging, as they mean huge disbursements for labor and construction. There are, however, a few who still believe that economy is wealth, and upon these few the duty of leadership in thrift continues to rest. Many American business men have reached the point at which they assert that financial exhaustion is the only way of checking the present extravagance. As to this, opinions differ, and the discussion of it will be endless.

Insofar as the immediate present or nearby future is concerned, the outlook is satisfactory, and a gradual improvement of the business tone in America seems probable, if not almost assured. The amount of money that has been raised for various wage funds throughout the country, and the appropriations that have been made by the National and State Governments, seem to assure at least a living wage for everyone who is willing to work during the few weeks that are left us before spring.

Meanwhile, industrial recovery is accelerating in many lines. Sales of cotton goods during the past six weeks have been nearly of boom proportions, and an increase in mill activity during the spring is practically certain. The output of automobiles and of iron and steel shows small gains, although it is doubtful whether they are more than seasonal. The trend of tin production is upward. Weekly building figures are a little more encouraging in their relation to last year, although there is no indication that building will increase sufficiently this year to pull the country out of depression by its own strength, as it did in 1921 and 1922. Car loadings are still below last year, but the volume of business, as indicated by bank clearings, is a little larger than had been expected. Therefore a summer of reasonable activity would seem to be ahead of us, and it is possible that we shall see an autumn of real prosperity.

In the commodity markets the week's news has been more cheerful. Rallies from the recent lows have occurred in a numerous group that includes hides, rubber, silk, and copper. Coffee is a little firmer and cotton has held its recent gains firmly. Cotton's advance of about 20 per cent from the December lows is probably a forerunner of what will take place in other commodities when distributors begin to build up their stocks again, and it is a demonstration of the truth that an apparent oversupply is no obstacle to price recovery once the replacement demand gets to work.

The stock market is less buoyant, but considering the news of decreased earnings and dividend omissions and reductions that is the aftermath of 1930 its action is encouraging and the bears are easily routed. In the bond market the immediate success of the government financing was followed by a strong demand for a $100,000,000 New York City issue, and now that the bonus loan issue is out of the papers an increase in bond business seems assured. It is almost always a forerunner of business expansion.

From Europe the news is even more encouraging. The adherence of Italy to the Five-Power Naval Pact, the settlement of the East India question by Ghandi and Lord Irwin, and the progress made toward tranquillity in China have combined to make the Oriental outlook more encouraging.

In the United States the people seem to be more interested in price fixing and its results than in the enormous sums voted by the 71st Congress, whose existence ended last Wednesday. No one can foresee what the future has in store for us, but we ought to have a fair degree of prosperity if American agriculturalists will reduce their acreage and be circumspect in selling their production. The fact that the decline in agricultural prices has now reached the corner grocery is being favorably commented upon by many housewives, and a parity between the cost of bread and flour as well as many other essentials is welcomed by the millions of consumers who have been compelled to accept a lower scale of wages.

The fate of price fixing in this country will probably be determined by the experience of the coming summer. If the Federal Farm Board can succeed in selling the staples that it has accumulated without depressing the markets keenly, we shall hear more of a venture that has attracted worldwide attention.

THE BUSINESS WEEK

March 11, 1931

Signs of spring are more striking in foreign than in domestic news. . . . Strengthening of commodity and security markets, slight declines in unemployment in Britain and Germany, may be mainly seasonal symptoms; but the naval agreement, the promise of peace in India, the many-sided moves toward opening long-term capital markets in Europe, are fundamentally constructive factors making for revival of confidence—now the crux of recovery. . . . To these, domestic developments have added little beside the relief from Congressional chaos. . . . Business activity has shown at the most only a feeble seasonal expansion so far. . . . Our index has drifted downward through February, and at the beginning of March stands at 77.4% of normal, only a little above the low point of December. . . . Commodity prices are still sagging, even seasonal credit expansion is lagging, and spring stock market enthusiasm is flagging. . . . Cotton and textiles are the brightest spots in the picture. . . . Adjournment of Congress till December leaves business, bankers, and government to their own devices; but the absence of any sign of plan or policy on their part, contrasted with the stir of constructive activity abroad, arouses wonder whether the assumed initiation of recovery here may not be another case of kidding ourselves along.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

A MOVEMENT upward of ¼c. per lb. in copper is reflected in similar advances in scrap crucible copper and fabricated brass, at New York warehouses. Zinc has moved up ⅛c. per lb., to 4.05c., E. St. Louis. Other non-ferrous metals hold to last week's prices, except babbitt, which declined ¼c. at New York, on highest grades. Steel buying is limited at mills and warehouses, most of the current transactions involving structurals, automotive or pipe line material. With this in view, consumers wonder at talk of increased prices for next quarter.

(All prices as of Mar. 6, 1931)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI:	
Ala. Foundry (Silicon, 1.75@2.25)	$14.19@$14.69
Tenn. Foundry (Silicon, 1.75@2.25)	14.19@ 14.69
NEW YORK:	
Buffalo No. 2 Fdry. (Silicon, 1.75@2.25)	19.91@ 20.41
BIRMINGHAM:	
No. 2 Foundry (Silicon 1.75@2.25)	14.00
PHILADELPHIA:	
Eastern Pa., No. 2x (Silicon, 2.25@2.75)	17.00
Virginia No. 2 (Silicon, 1.75@2.25)	17.75
Basic	17.25@ 17.75
CHICAGO:	
No. 2 Foundry, Northern (Silicon, 1.75@2.25)	17.50
No. 2 Foundry, Southern	17.01
PITTSBURGH: (including freight charge, $1.76, from Valley)	
No. 2 Foundry	18.13
Basic	17.63@18.63
Bessemer	17.63@18.63

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90	3.35†	3.00	3.00†
No. 12	1.95	3.45†	3.10	3.05†
No. 14	2.05	3.55†	3.20	3.10†
No. 16	2.15	3.65†	3.30	3.20†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.30
No. 22	2.30@2.40	3.75†	3.55	3.45
No. 24	2.35@2.45	3.80†	3.60	3.50
No. 26	2.45@2.55	3.90†	3.70	3.60
No. 28	2.60@2.70	4.05†	3.85	3.75
Galvanized				
No. 10	2.20@2.30	3.65†	3.50	3.35
Nos. 12 to 14	2.30@2.40	3.75†	3.60	3.40
No. 16	2.40@2.50	3.85†	3.70	3.50
No. 18	2.55@2.65	4.00†	3.85	3.65
No. 20	2.70@2.80	4.15†	4.00	3.80
No. 22	2.75@2.85	4.20†	4.05	3.85
No. 24	2.90@3.00	4.35†	4.20	4.00
No. 26	3.15@3.25	4.60†	4.35	4.25
No. 28	3.40@3.50	4.85†	4.70	4.50

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.275	1.9	1.61	.145
½	.37	2.375	2.067	.154
⅝	.585	2.875	2.469	.203
¾	.765	3.5	3.068	.216
⅞	.97	4.0	3.548	.226
1	1.09	4.5	4.026	.237
1¼	1.48	5.563	5.047	.258
1½	1.92	6.625	6.065	.28
2	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

—Thickness— B.w.g. and Decimal	Fractions	Outside Diameter in Inches ⅛	¼	⅜	½	¾	1	1¼	1½
		Price per Foot							
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049″	18	.17	.18	.19	.20	.21	.23	.25	
.065″	16	.19	.20	.21	.22	.23	.25	.27	
.083″	14	.20	.22	.23	.24	.25	.27	.29	
.095″	13	.21	.23	.25	.26	.27	.29	.31	
.109″	12	.22	.24	.26	.27	.28	.30	.32	
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33	
.134″	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.65†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin., flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	2.95	3.00†
Soft steel bars and bar shapes	3.10†	2.95	2.90†
Soft steel bands	3.40†	3.20	3.10†
Rivets, structural or boiler	4.25	....	4.00
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	2.90†
Drill rod (from list)	65%	55%	60%

*Flat, $\frac{3}{16}$-in. thick by $\frac{3}{4}$-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			11.50@12.00
Tin, Straits, pigs, New York			29.00@30.00
Lead, pigs, E. St. Louis	4.35	New York	5.50 @6.50
Zinc, slabs, E. St. Louis	4.05	New York	5.50 @6.50

	New York	Cleveland	Chicago
Antimony, slabs	10.00@10.50	10.50	10.75
Copper sheets*	20.37½	20.37½	20.00
Copper wire*	12.25	12.62½	12.37½
Copper, drawn, round*	18.87½	19.37½	18.50
Copper tubing*	22.87½	22.87½	22.50
Brass sheets, high*	17.62½	17.62½	17.37½
Brass tubing, high*	22.50	22.87½	22.25
Brass rods, high*	15.87½	15.87½	15.62½
Brass wire, high*	18.12½	18.12½	17.87½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.36
Solder (½ and ½)	22.00	21.50	18@20

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	45.25
Commercial genuine, intermediate grade	34.25
Anti-friction metal, general service	29.00
No. 4 babbitt, f.o.b.	10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	8.25	7.75	7.25@7.75
Copper, heavy, and wire	7.25	7.50	6.75@7.25
Copper, light, and bottoms	6.25	6.50	6.00@6.50
Heavy lead	3.25	3.50	3.00@3.50
Lead battery plates	1.25	2.50	2.00@2.50
Brass, heavy, yellow	4.00	4.50	4.00@4.50
Brass, heavy, red	7.00	7.00	6.25@6.75
Brass, light	3.50	3.25	3.50@4.00
No. 1 rod-brass turnings	4.75	4.50	4.25@4.75
Zinc	1.50	1.50	1.25@1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.15	38.00 per M	.14½
Sal soda, per lb.	.01½	.02	.02
Roll sulphur, per lb.	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.10	.099	.104
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.75	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	50%
Med. grade, heavy wgt.	30%	30–5%	40%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	70%	50–10%	60%
Second grade	65–5%	60–5%	65%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.034
Brass rods	per lb.	.1587½	.1512½	.2125
Solder (½ and ½)	per lb.	.22	.22	.2925
Cotton waste, white	per lb.	13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.59
Lard cutting oil	per gal.	.75	.75	.75
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65–10%	65–10%	50–10%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.50
Coke, prompt foundry, per net ton	Connellsville,		3.25@4.85
White lead, dry	100 lb. kegs	New York,	13.25
White lead, in oil	100 lb. kegs	New York,	13.25
Red lead, dry	100 lb. kegs	New York,	13.25
Red lead, in oil	100 lb. kegs	New York,	14.75

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from latest list, dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65–10%
Larger, up to 1 x 30-in., full kegs, list less	65–10%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65–10%
Larger, list less	65–10%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.25
Structural, round head, broken kegs, net	5.75
Tank, 7/16-in. dia. and smaller, list less	60–10%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65–10%
Larger, up to 3-in., list less	65–10%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$3.50
Wrought, broken kegs, per 100 lb., list less	1.50
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mass., Cambridge (Boston P. O.) — New Method Die Co., 30 Cross St.—large size jig scroll saw, self contained or two piece unit, belt or motor driven, also wood workers corrugated fastening machine.

Minn., Minneapolis—Bd. of Education, 305 City Hall, F. S. Gram, Purch. Agt.—will receive bids until Mar. 19 for metal shop equipment, including power machines.

Opportunities for Future Business

Ark., El Dorado—City Council, plans the construction of a municipal airport, including hangar, repair shop, etc. Jones, Roessle, Olschner & Weiner, Shreveport, Archts.

Conn., Waterbury—Kaplan Bros., 352 East Main St., is receiving bids for a 1 story, 60 x 115 ft. garage, service station, etc., on East Main St. Estimated cost $40,000. T. M. Freney, 51 Leavenworth St., Archt. Noted Jan. 29.

Ind., Auburn — Rieke Metal Products Co., West 15th St., plans to rebuild plant recently destroyed by fire. Loss $20,000.

Ind., Elkhart—Texas Oil Co., will build a service station at 916 South Main St. Estimated cost $40,000. Private plans. Work will be done by separate contracts.

Ind., South Bend — Sibley Machine Works, plans a 1 story, 80 x 100 ft. foundry. F. D. Chase, Inc., 720 North Michigan Blvd., Chicago, Ill., Archts. and Engrs.

Kan., Wichita — Goodrich-Silverton Co., awarded contract for a 2 story service building. Estimated cost $30,000.

Md., Baltimore — Stewart & Co., Lexington and Howard Sts., will soon award contract for a 2 story, 142 x 202 ft. garage building, etc., at Josephine St. between Pine and Arch Sts. J. E. Sperry, Calvert Bldg., Archt.

Mass., Hingham—Town, W. L. Foster, Chn. Bd. of Selectmen, is having sketches made for a 1 story garage, etc. Estimated cost $40,000. L. Foster, 6 Middle St., Archt.

Mass., Quincy (Boston P. O.)—Corey Bros., 12 Shaw St., is having plans prepared for a 1 story, 60 x 100 ft. garage at 756 Washington St. Estimated cost $50,000. Private plans. Noted Dec. 4.

Mass., Somerville (Boston P. O.)—Somerville Iron Foundry Co., 83 Washington St., will build a 1 story, 55 x 150 ft. plant. Estimated cost $50,000.

Mass., Taunton—Taunton Pearl Works, 35 Vernon St., are receiving bids for remodeling 2 story manufacturing building. Estimated cost $50,000. Jackson & Moreland, Park Sq. Bldg., Boston, Archts.

Mass., Watertown—Bd. Selectmen, plans the construction of a municipal service garage. Estimated cost $75,000. Architect not selected.

Mich., Marysville — Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa., plans the construction of a glass manufacturing plant and terminal here. Estimated cost to exceed $200,000. Maturity indefinite.

Mich., Wayne — Stinson Aircraft Corp., awarded contract for a 2 story addition to assembly plant. Estimated cost $30,000.

Minn., St. Paul—Ellerbe & Co., Minnesota Bldg., Archts. and Engrs., will soon receive bids for an 8 story garage and repair shop and service building. Estimated cost $350,000. Owner withheld.

Miss., Jackson—International Match Co., 25 West 43rd St., New York, N. Y., will soon award contract for the construction of a factory, including two warehouses and five outbuildings here. Estimated cost $80,000. N. W. Overstreet, Mississippi Fire Insurance Bldg., Jackson, Archt.

Miss., Natchez—Mississippi Match Co., will soon award contract for the construction of a factory. Estimated cost $80,000. N. W. Overstreet, Jackson, Archt.

N. J., East Rutherford — East Rutherford Syringe Co., 75 Mozart St., postponed construction of a 2 story factory at 54 Mozart St. $40,000. J. T. Camlet, 26 Piaget Ave., Clifton, Archt. Indefinite when project will mature. Noted Feb. 26.

N. J., Jersey City—Jersey City Ladder Co., Inc., 677 Montgomery St., will not construct 2 story, 45 x 140 ft. factory at ft. of Crawford St. $50,000. B. Singer, 921 Bergen Ave., Archt. Project in abeyance. Noted Feb. 26.

N. J., Long Branch — W. E. Herbert, 376 Walburton Pl., (sheet metal work), plans a 1 story addition to plant. Estimated cost $18,000.

N. J., Newark—Bd. of Education, City Hall Annex, postponed construction of 5 story repair department building at Coes Pl. and Marshall St. Estimated cost $200,000. Architect announced. Project will probably mature in June. Noted Feb. 5.

N. J., New Brunswick—Metallo Gasket Co., 16 Bethany St., awarded contract for a 2 story addition to factory. Estimated cost $40,000.

N. Y., Brooklyn—Dept. of Hospitals, Municipal Bldg., New York, will receive bids about May 1 for the construction of a 2 story, 75 x 110 ft. garage, etc., at Ocean Parkway and Ave. Z. Estimated cost $450,000. LeRoy P. Ward, 205 East 42nd St., New York, Archt. Noted Jan. 15.

N. Y., Flushing—A. Beaudel, 140-34 Brookville Blvd., Rosedale, will receive bids about April 10 for the construction of a 2 story repair shop at Brookville and Conduit Blvds. here. Estimated cost $40,000. Private plans. Noted Feb. 26.

N. Y., Flushing—Polk Realty Corp., 26 Court St., Brooklyn, will receive bids about October for a 100 x 198 ft. service garage at 39th Ave. and 170th St. here. Estimated cost $65,000. J. Millman, 67 Court St., Brooklyn, Archt. Noted Feb. 26.

N. Y., New York—Dept. of Hospitals, will receive bids about April 1 for the construction of a garage at City Hospital, Welfare Island. Estimated cost $150,000. B. R. Swartburg, 2 West 46th St., Archt.

N. Y., Richmond Hill—Mymand Construction Co., 6730 75th St., Middle Village, will build a service garage at Gould and Addition Aves. Estimated cost $40,000. M. Perlstein, 6735 75th St., Middle Village, Archt. Noted Feb. 26.

N. Y., Woodside—Mymand Construction Co., 6730 75th St., Middle Village, will build a 100 x 125 ft. service garage at 54th St. and 39th Ave. Estimated cost $40,000. M. Perlstein, 6735 75th St., Middle Village, Archt. Work will be done by day labor and separate contracts. Noted Feb. 26.

O., Cleveland — Goldman Bros., 524 East 110th St., Gen. Contrs., are having plans prepared for the construction of a 2 story, 80 x 266 ft. garage on Fairfield Ave. Estimated cost $50,000. G. Rudolph, 6409 Quimby Ave., Archt.

O., Cleveland—Industrial Rayon Corp., H. S. Rivitz, Pres., West 98th St. and Walford Ave., manufacturers of viscose wrapping paper, plans the construction of a factory. Estimated cost to exceed $50,000. Christian, Schwarzenberg & Gaede, 1836 Euclid Ave., Archts. and Engrs.

O., Dayton—Hohman Plating Co., 815 East 5th St., is having sketches made for the construction of a 3 story factory at Second and Taylor Sts. Estimated cost $100,000. J. Huhn, 204 McClure St., Archt.

Pa., Tarentum—Tarentum Steel Co., A. W. Barrett, Pres., Pittsburgh, and Miller Printing Machinery Co., 1117 Reedsdale St., Pittsburgh, plan the construction of a steel mill here. Estimated cost $1,500,000. L. F. Galbraith, Tarentum, is engineer.

Pa., Grove City—Sterling Oil Co., Emlenton, awarded contract for a 1 story service station here. Estimated cost $40,000.

Pa., Oil City—Owner, c/o J. H. Hicks, 701 Palace Hardware Bldg., Erie, Archt., is having plans prepared for a 1 story, 42 x 42 and 32 x 32 ft. service station, garage, etc., here. Estimated cost $40,000.

Pa., Pittsburgh—Mayer Body Corp., W. G. Mayer, 6459 Frankstown Ave., will soon award contract for two additions to plant, 1 story, 30 x 100 ft. and 2 story, 50 x 100 ft. at 6461 Frankstown Ave. Lake & Davidson, Negley Bldg., Archts.

Pa., Pittsburgh — National Lead & Oil Co., 1376 River Ave., plans rebuilding part of plant recently destroyed by fire. Estimated cost including equipment $40,000.

Pa., Corry—Standard Automatic Products Co., L. T. McElroy, Gen. Mgr., 611 West Main St., plans the construction of a 1 story factory. Estimated cost $40,000. Architect not selected. Maturity about June 1.

R. I., Newport—Bureau of Yards & Docks, Navy Dept., Washington, D. C., is receiving bids for extension of assembly shop at Naval Torpedo station, Goat Island here. Estimated cost $125,000. Private plans. Noted Mar. 5.

Tenn., Memphis—Bluff City Delivery Co., R. G. Watkins, Pres., 308 Court St., plans the construction of a garage at 305-25 Jefferson Ave. Estimated cost $50,000. Hanker & Cairns, Court Sq. Bldg., Archts.

Tenn., Memphis — U. S. Veterans Bureau, Arlington Bldg., Washington, D. C., will receive bids until Mar. 17 for the construction of garage, etc., at U. S. Veterans Hospital, here.

Va., Norfolk — Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded contract for addition to plumber shop here. $24,609.

Wash., Seattle — Elliott Bay Mill Co., 600 West Spokane St., awarded contract for a 1 story addition to mill. Estimated cost $40,000

Wash., Seattle — Pacific Coast Steel Co., Youngstown Pl., plans the construction of a 1 story, 88 x 400 ft. warehouse at 4001 28th St. N. W. Estimated cost $40,000. Private plans.

Wis., Milwaukee—G. W. Hirth Co., 727 West Chambers St., will build a 1 story, 123 x 110 x 24 ft. garage on Hubbard St.

Wis., Milwaukee — Zenith Mfg. Corp., 619 Center St., is having plans prepared for addition to plant for the manufacture of replacement cylinder heads, automotive equipment, airplane carburetors, etc. Estimated cost $115,000.

Wis., Waukesha—Waukesha Pattern Works, awarded contract for the construction of a 2 story, 50 x 100 ft. plant. Noted Feb. 26.

B. C., Vancouver—Ford Motor Car Co. of Canada Ltd., c/o W. R. Campbell, 1160 Hamilton St., is having plans prepared for the construction of an assembly plant at Burnaby Way. Estimated cost $1,000,000. Private plans.

B. C., Victoria—Cameron Lumber Co. Ltd., J. O. Cameron, Pres., plans to rebuild saw mill at Inner Harbour recently destroyed by fire. Estimated cost $200,000 including equipment. Private plans.

Ont., Alfred — A. J. Hazelgrove, Ottawa, Archt., will receive bids about April 1 for the construction of a 2 story industrial school near here, for Christian Brotherhood of Canada, Montreal. Estimated cost $200,000.

Ont., Copperclife—International Nickel Co., awarded contract for a precious metals separation plant. Estimated cost $1,000,000.

Ont., Kingston—Colonial Coach Lines, Ltd., awarded contract for the construction of a garage, office, etc., on Queen St. Estimated cost $11,000.

Que., Lachine—Jenkins Bros. Ltd., 617 St. Remi St. W., Montreal, had plans prepared for a foundry here. Ross & MacDonald, 601 Belmont St., Montreal, Archts.

Holland, Amsterdam—Ford Motor Co., 3174 Schaefer Rd., Dearborn, Mich., plans the construction of a manufacturing and assembly plant here. Estimated cost to exceed $1,000,000. Maturity about April 1.